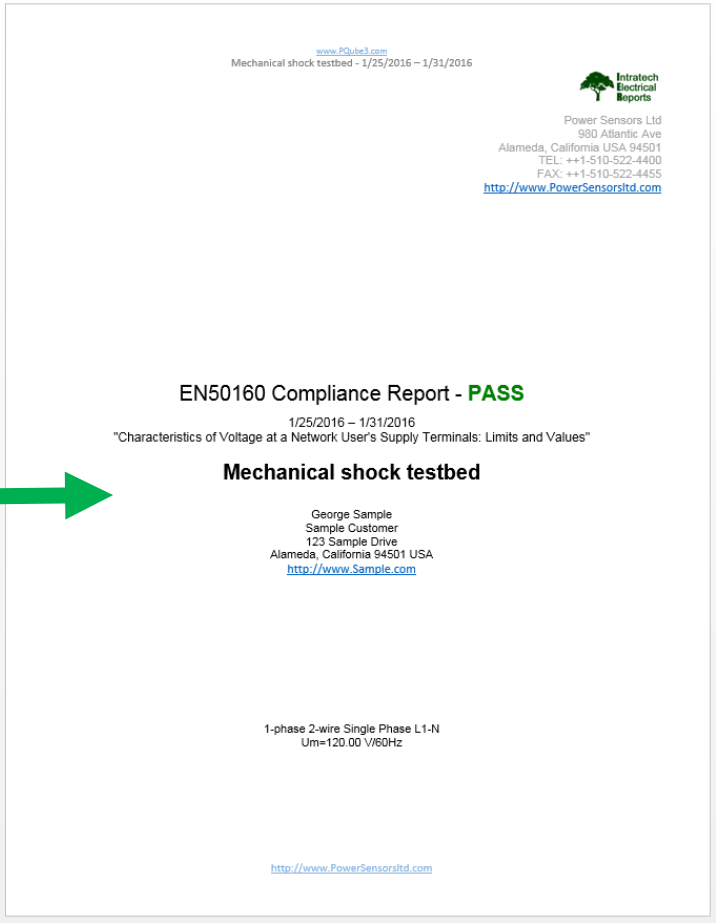
PQube® Report Writer 3.0

User's Guide



PSL

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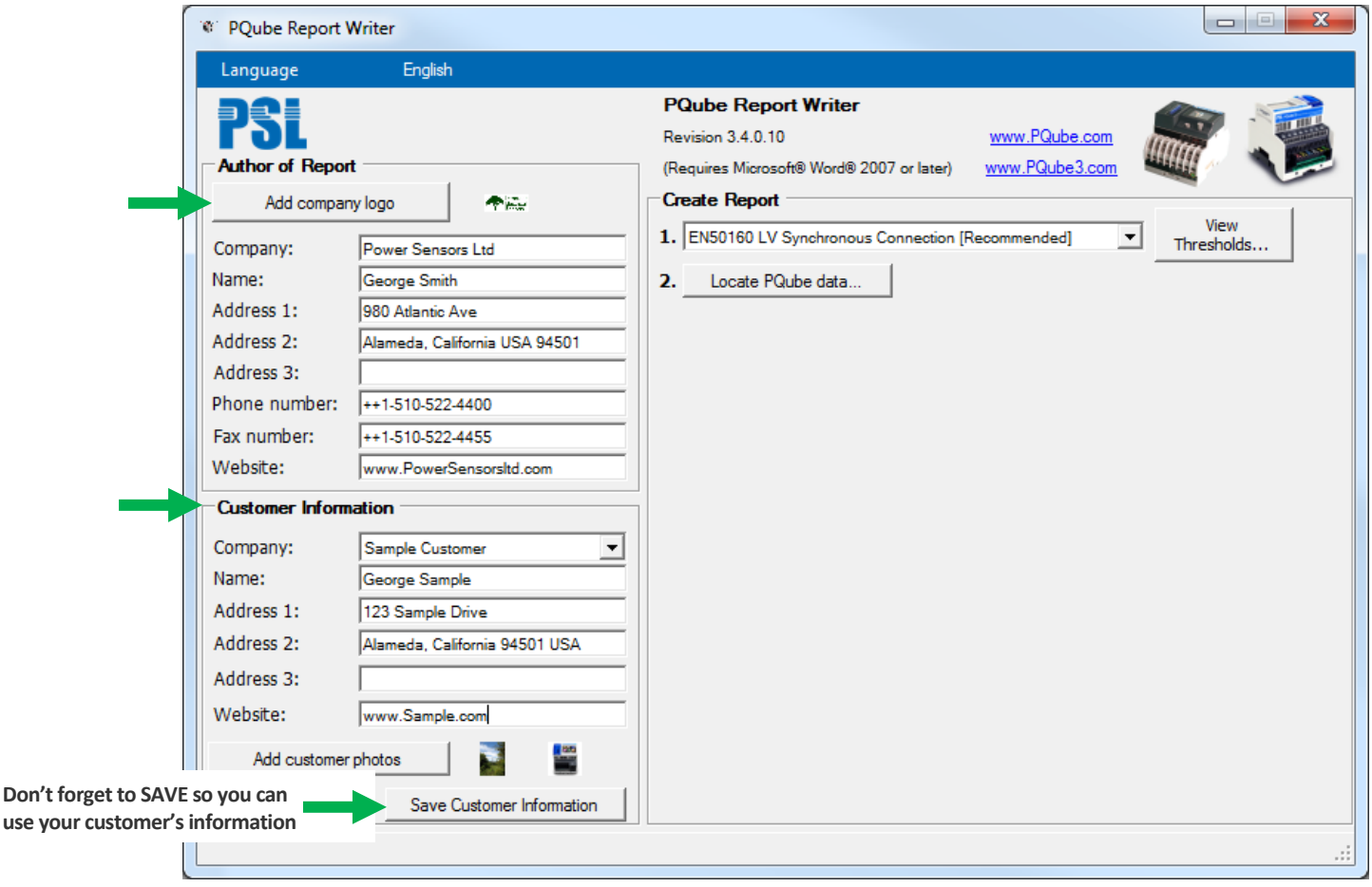
What is the PQube® Report Writer?

A program that writes standard-based and custom reports for you

The PQube® Report Writer is a Windows® program that writes complete, ready-to-give-to-your-customer Microsoft Word® reports. The reports compare the requirements of international standards such as EN50160[1] to the data recorded by your PQube, and can announce compliance or noncompliance. In addition, you can create custom reports and set your own thresholds, limits, coverage, etc.

NOTE: The PQube® Report Writer assumes that you – the report author – work for one company, and the report is being prepared for another company, your customer.

The PQube® Report Writer prepares customized reports automatically, using information you provide about you and the customer in the main Report Writer window. Then automatically inserts the customer data you provided in the appropriate places in the report, including any photographs. Each report is labelled with your company's letterhead and logo. Just print and deliver it to your customer!



[1]EN50160 is a European standard that defines the voltage characteristics of the electricity supplied by public distribution systems.

What types of reports can the Report Writer generate?

Standards-based reports, including EN50160

The PQube® Report Writer comes with a library of international standards, including all six versions of EN50160. You can choose a standard in the main Report Writer window to create a report based on that standard.

Custom reports, such as IEC 61000-3-2

You can create your own custom report and add new standards to the library, such as your own national standards. Simply select NEW and create a brand new report. The PQube® Report Writer will store these new standards so they are immediately available for future reports.

PQube Trends, Energy, and Harmonics

Only interested in looking at your energy usage? Harmonic compliance levels? Or want to see all your PQube's power readings? Select Energy, Harmonics or PQube Trends from the drop-down menu.

Reports in any language: English, Français, Deutsch, etc.

The PQube® Report Writer operates in any language, and can write reports in any language. It comes with several languages built in.

Easy to add new languages, too

You can add any language you want to your list of available languages. Just copy and rename a text file (in the "Languages" folder), and translate the phrases in the text file. From then on, your new language will be available in the Languages menu of your PQube® Report Writer.

Installing the Report Writer program

System Requirements

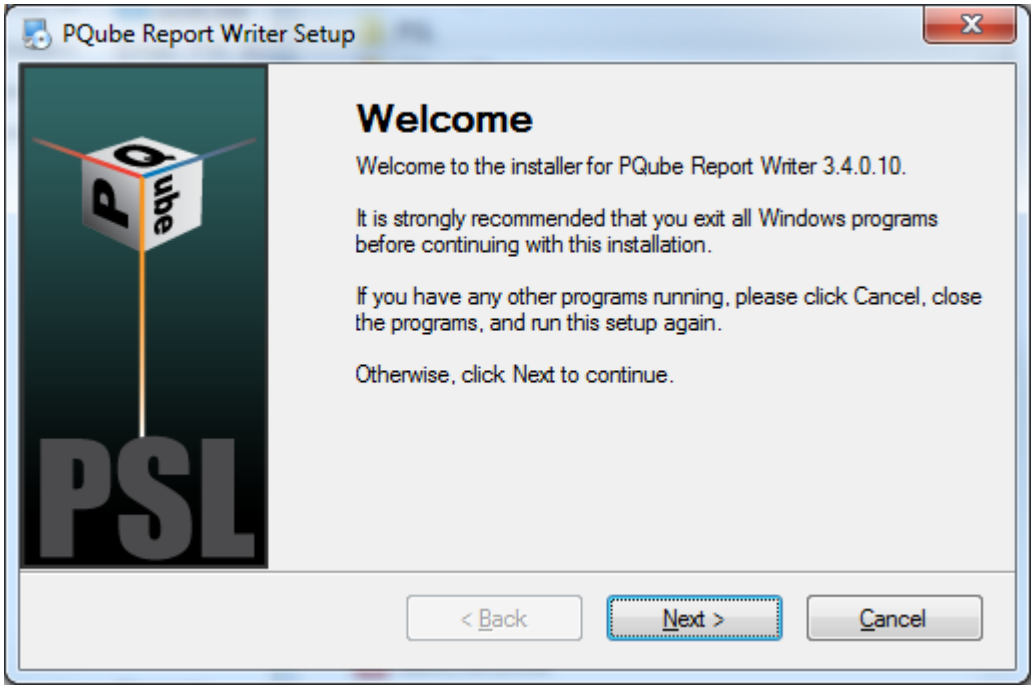
To install the PQube® Report Writer program, you will need:

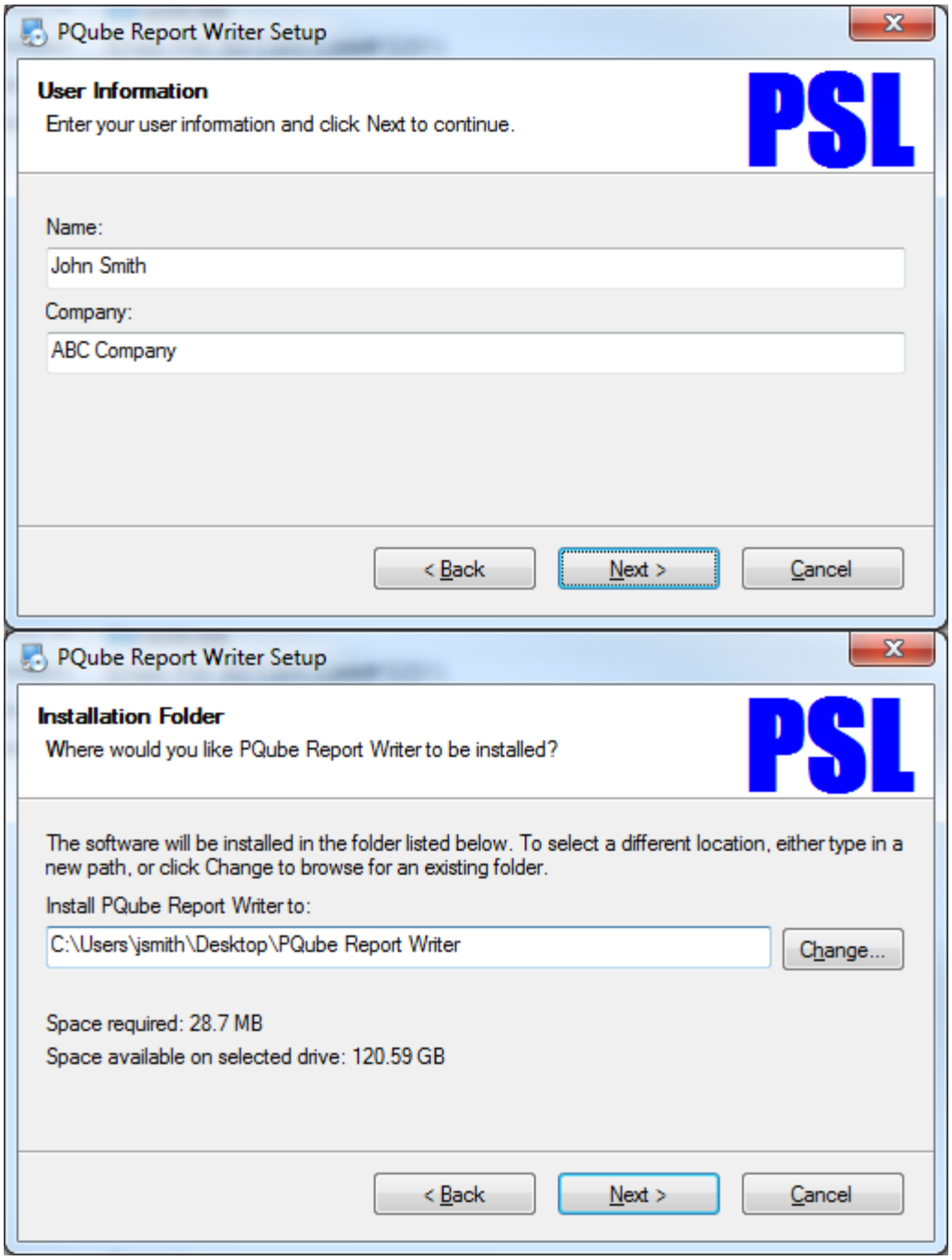
- Microsoft® Word 2007 or later. Open Office version of Word will not work.
- At least 1GB of free RAM memory.
- ADMIN privileges if installing in the C:\Program Files directory.

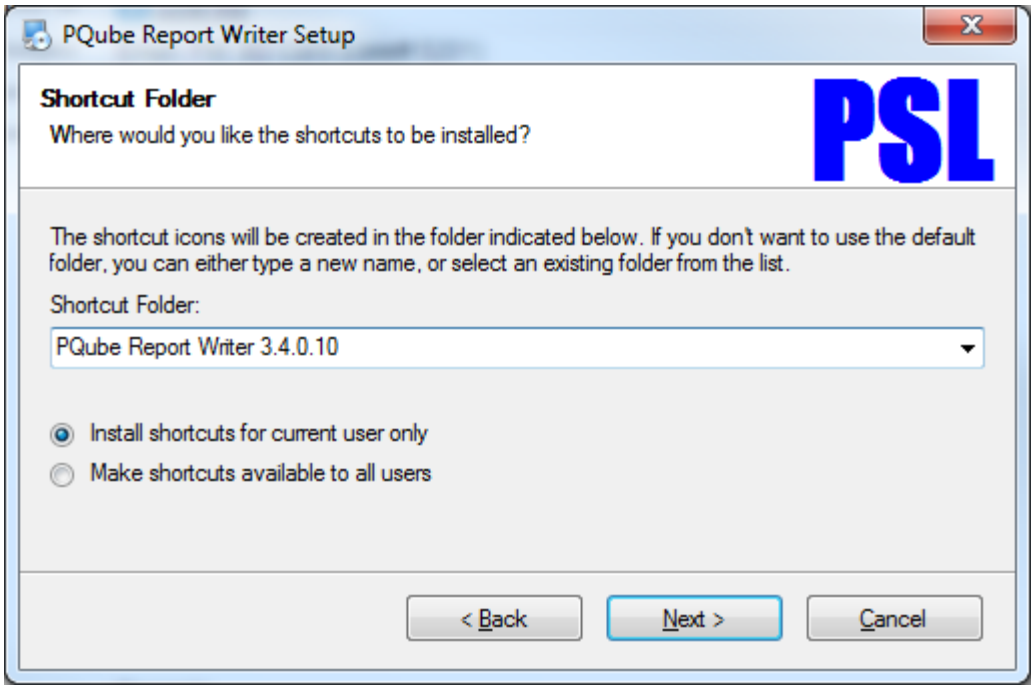
Installing the Report Writer program

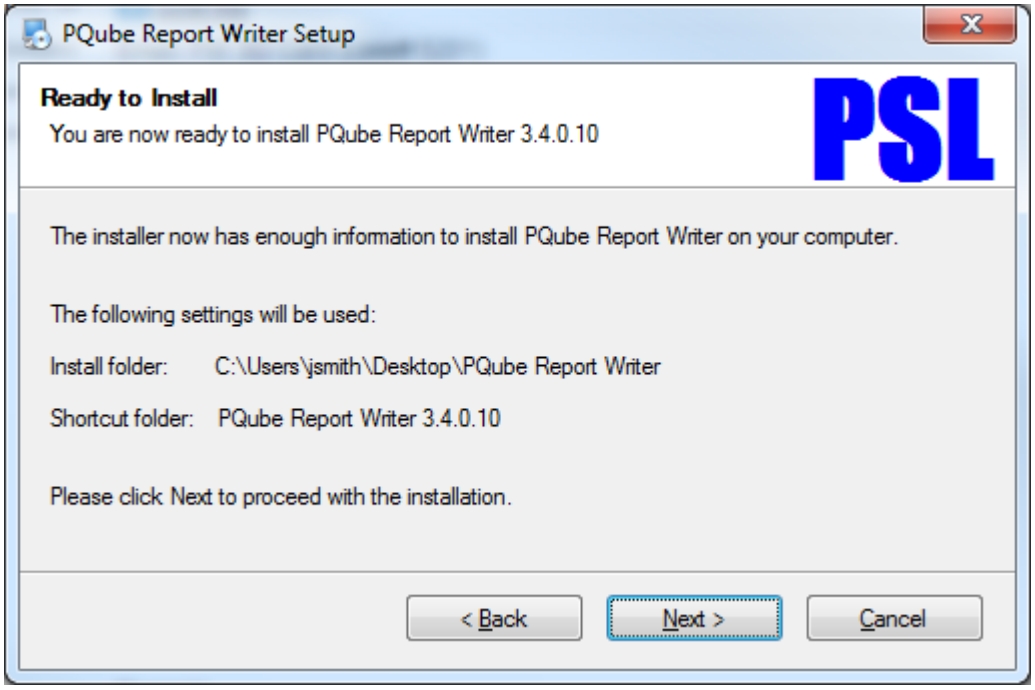
Download the PQube® Report Writer program at www.PQube.com/writer.

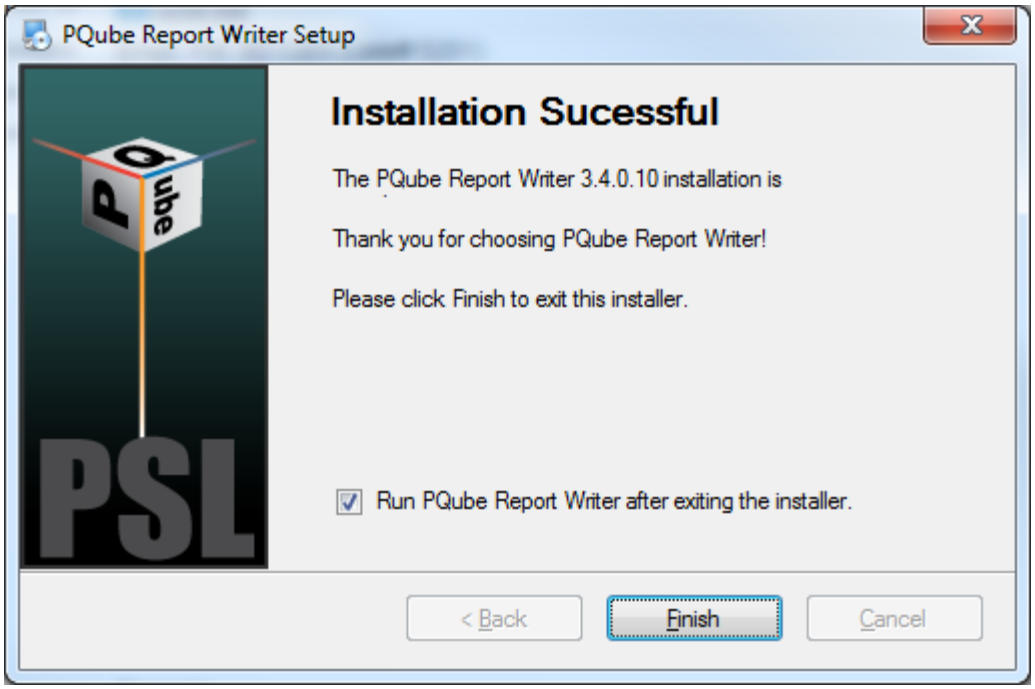
It is a compressed (zipped) file so you will first need to extract (unzip) it to run the executable. A file called "Install PQube Report Writer.exe" will be created. Double click on this to install the program. You will get the PQube® Report Writer Setup screen. Click on "Next" to continue.

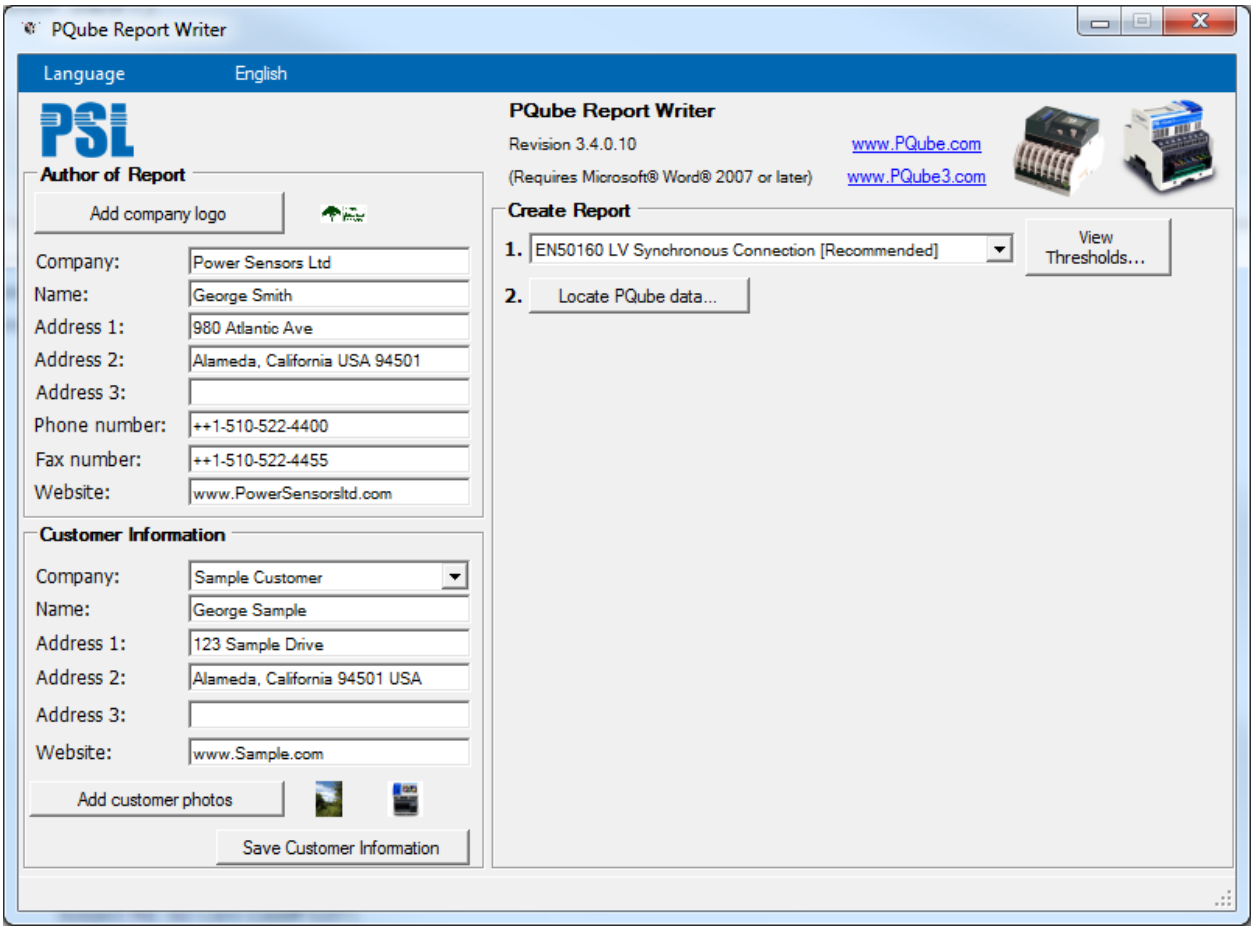



PQube Report Writer Setup
User Information
Enter your user information and click Next to continue.
PSL
Name:
John Smith
Company:
ABC Company
< Back
Next >
Cancel
PQube Report Writer Setup
Installation Folder
Where would you like PQube Report Writer to be installed?
PSL
The software will be installed in the folder listed below. To select a different location, either type in a new path, or click Change to browse for an existing folder.
Install PQube Report Writer to:
C:\Users\jsmith\Desktop\PQube Report Writer
Change...
Space required: 28.7 MB
Space available on selected drive: 120.59 GB
< Back
Next >
Cancel


PQube Report Writer Setup
Shortcut Folder
Where would you like the shortcuts to be installed?
PSL
The shortcut icons will be created in the folder indicated below. If you don't want to use the default folder, you can either type a new name, or select an existing folder from the list.
Shortcut Folder:
PQube Report Writer 3.4.0.10
Install shortcuts for current user only
Make shortcuts available to all users
< Back
Next >
Cancel


PQube Report Writer Setup
Ready to Install
You are now ready to install PQube Report Writer 3.4.0.10
PSL
The installer now has enough information to install PQube Report Writer on your computer.
The following settings will be used:
Install folder: C:\Users\jsmith\Desktop\PQube Report Writer
Shortcut folder: PQube Report Writer 3.4.0.10
Please click Next to proceed with the installation.
< Back
Next >
Cancel





That's it! You're ready to use the program.

How to use Report Writer program

You must have Microsoft® Word® 2007 or later

The PQube® Report Writer Program actually writes your report in Microsoft® Word®. To use this program, you *must* have Microsoft Word 2007 or later. Note that Open Office version of Word will not work.

Configuring your PQube's Setup.ini for an EN50160 report

To include EN50160 requirements such as **harmonics, flicker, voltage unbalance, voltage THD**, **10-sec frequency** in your EN50160 report, it is important to properly configure your PQube's Setup.ini parameters ***prior*** to measuring and recording data. Below are the parameters which need to be enabled in your Setup.ini file.

PQube Classic: Trend Harmonics (10 or 15 min. intervals), Voltage THD, Voltage Unbalance, Flicker

PQube 3: Record IEC 61000-4-30 10 min interval, Record 10 second frequency, Voltage THD, Voltage unbalance, Flicker. Note that if "Record 10 second frequency" is enabled in your PQube 3's Setup.ini, only averages for frequency will be reported.

Or click on the "EN50160 Settings" button in your PQube Configurator program and it will automatically enable these settings for you. Below are links to download the Configurator programs,

PQube Classic Configurator program: http://www.powersensorsltd.com/PQube#config

PQube 3 Configurator program: http://www.powersensorsltd.com/PQube3#config

Very important. Use either a comma (,) or semi-colon (;) as your CSV separator for the PQube trends output formatting in the Setup.ini file (default is set to comma). ***Do not use [tab]***. The Report Writer program does not recognize the use of the [tab] separator and will generate a 'Date' not valid error message.

You must have PQube-recorded data

To create a report, you will need to import the recordings from your PQube. We recommend that you copy ALL the data from your PQube to your computer. Or simply generate your report directly from your SD card or USB drive! If you don't have physical access to the PQube, you can download the files via FTP. The Report Writer program uses the Daily/Weekly/Monthly Trends data which can be found in the /<year>/<month>/<day> folders. When downloading the files remotely to your computer, it is important to maintain the same file directory structure found on your PQube. For more information on how to transfer PQube files for the Report Writer program, download our PQube Report Writer Data Transfer Guide at http://PQube.com/writer.

Enter information about your company

Enter information about your company in the main Report Writer window. The PQube® Report Writer uses this information to prepare a Microsoft® Word® report that is correctly formatted with your company as the preparer of the report. The PQube® Report Writer automatically remembers all of your company's data, so you only need to enter it once.

Your company's logo

If you want your company's logo to appear on every report, click on **Add Company Logo** and select a file that contains a picture of your logo in JPG, PNG, or GIF format. Don't worry about the size of the picture – the PQube® Report Writer will automatically resize it to fit.

Your company's contact information

Fill in your company's contact information. The PQube® Report Writer will automatically put it in the correct locations in your report.

Your company's website

Add your company's website. It will appear on every page of the report. Your customer will know exactly who prepared the report!

Enter information about your customer

Enter information about your customer right below your company's information. This information will change based on who you are preparing the report for. Click the **Save Customer Information** button to save the customer information for future use.

Once you have saved a customer, this customer's information will be automatically available on the Customer drop-down list. You don't need to enter it again.

To enter a new customer, choose **New** from the Customer drop-down list, choose a new name for this customer, and enter the data for this customer.

Customer name, address and website

The PQube® Report Writer will automatically insert your customer's name, address and website at the correct locations in your report. If you clicked on the **Save Customer Information** button, this data will automatically be available to you in the future.

Customer photographs

Often, you will take one or two photographs at your customer's site. These photos can make the report more clear and complete. Click on **Add customer photos** to add photos and captions for the photos.

The photo files can be any format (usually JPG). The photos must be in the correct orientation – the PQube® Report Writer will not rotate them. Don't worry about the size or proportions of the photos – the PQube Report Writer will automatically scale them to fit the report.

Choose a standard or create a brand new report

The PQube® Report Writer prepares a report based on your PQube's recorded data and the requirements of an international standard or your custom limits/threshold settings.

Choose a standard from the drop-down list on the right side of the Report Writer window. You will see that six versions of the EN50160 Standard are already included: Low Voltage, Medium Voltage, High Voltage, and, each in a Synchronous Connection or Island Connection mode.

You can add new standards

Perhaps you want to add another standard – a new one, or one that doesn't come with the program. From the Standard drop-down list, choose **New**, and name your new standard. You can then edit all the thresholds, the comments, and all the parameters of the standard; when you click **SAVE**, that new standard will be available for your future use.

Choose a language

The PQube® Report Writer operates in different languages too! On the upper left corner, click on **Language** and select the language from the drop-down menu. The PQube® Report Writer will automatically remember your preferred language, and will write its reports in that language.

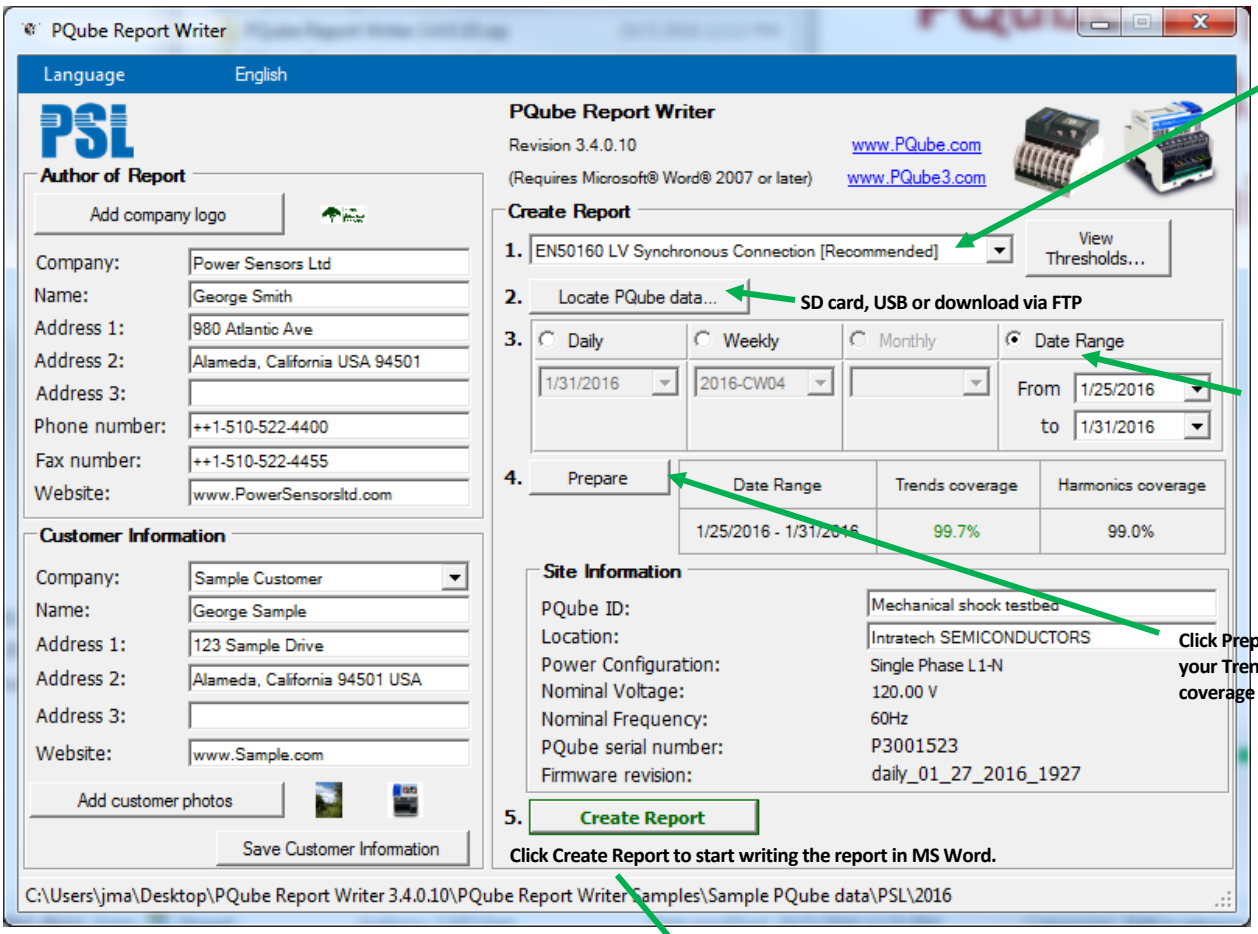
You can add new languages, too

If you don't see your language, it's easy to add one. Find the folder called "PQube Report Writer Languages" and copy one of the text files. Rename the copy with the name of your new language. Then edit this new file by translating all of the phrases in your new language. Restart your PQube® Report Writer, and your new language will automatically become available under the **Language** button. (We would be grateful if you would send a copy of your new language text file to support@PowerSensorsLtd.com - we will add it to the next release, with full credit to you!)

Write the report

After you have loaded and prepared your data, click on the **Create Report** button, and the PQube Report Writer will automatically launch Microsoft® Word® and start writing the report!

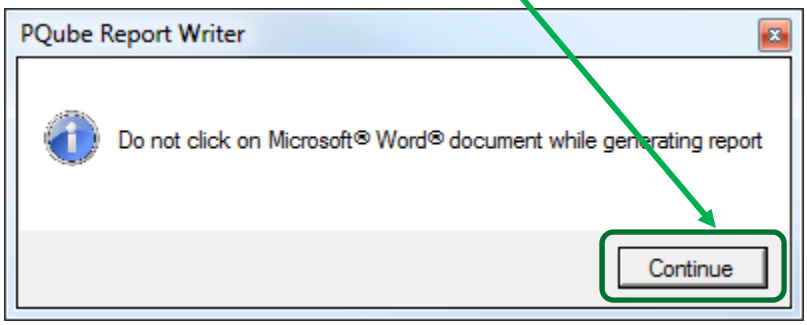
You can watch the report being prepared. Wait until the report is finished (you will see the Conclusions page). **DO NOT click on or move the cursor on the Word document while the PQube® Report Writer is running. Also DO NOT open any other Word document. This may interrupt the program and generate an error.**



Choose an EN50160 standard or create your own! You can customize your report by clicking on the Edit Thresholds button. Note that you can only View Thresholds for EN50160 reports.

Choose Daily, Weekly, Monthly or Date Range for your report.

Click Prepare to calculate your Trends and Harmonics coverage for your report.

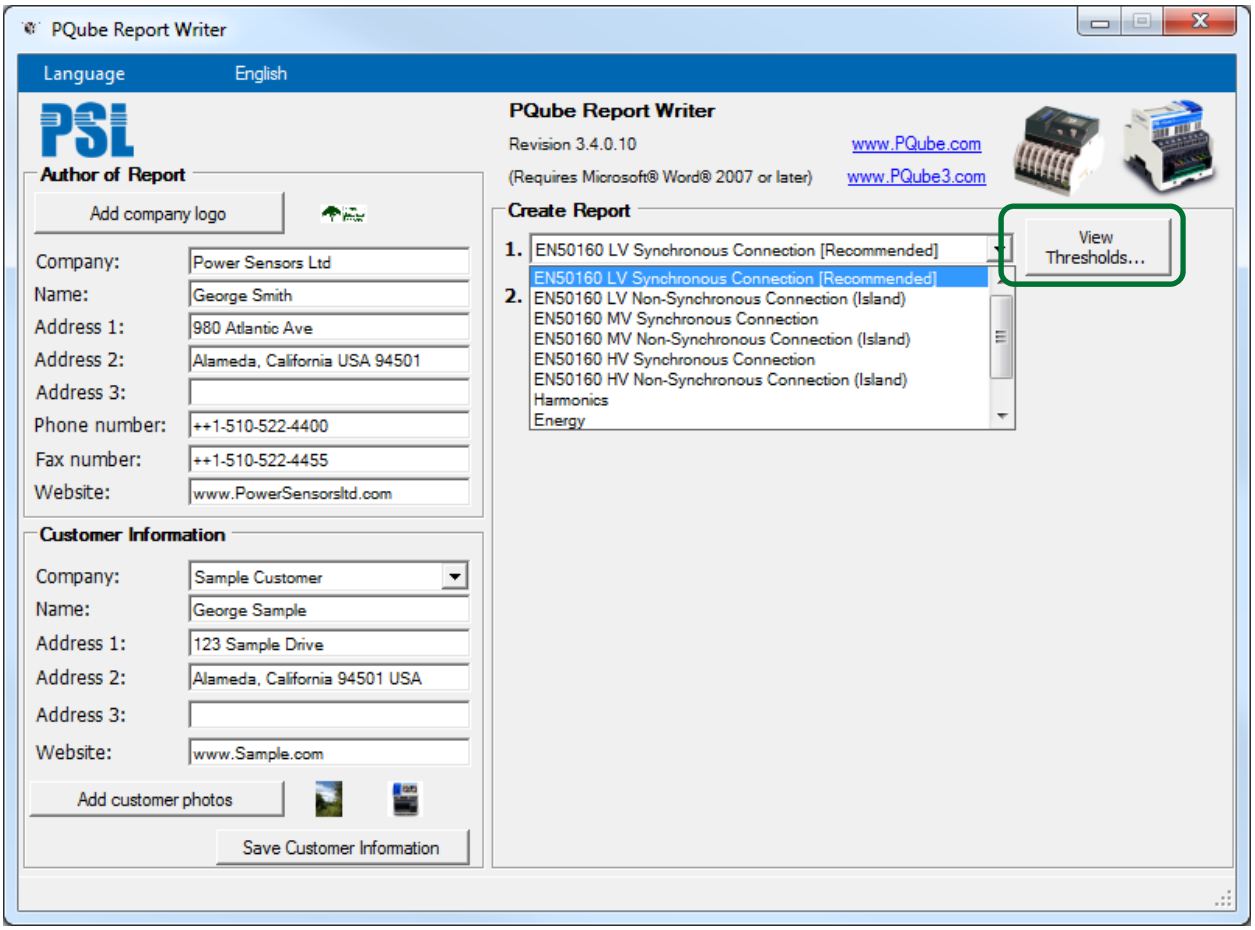


How to choose a standard, create a new one, and customize your report

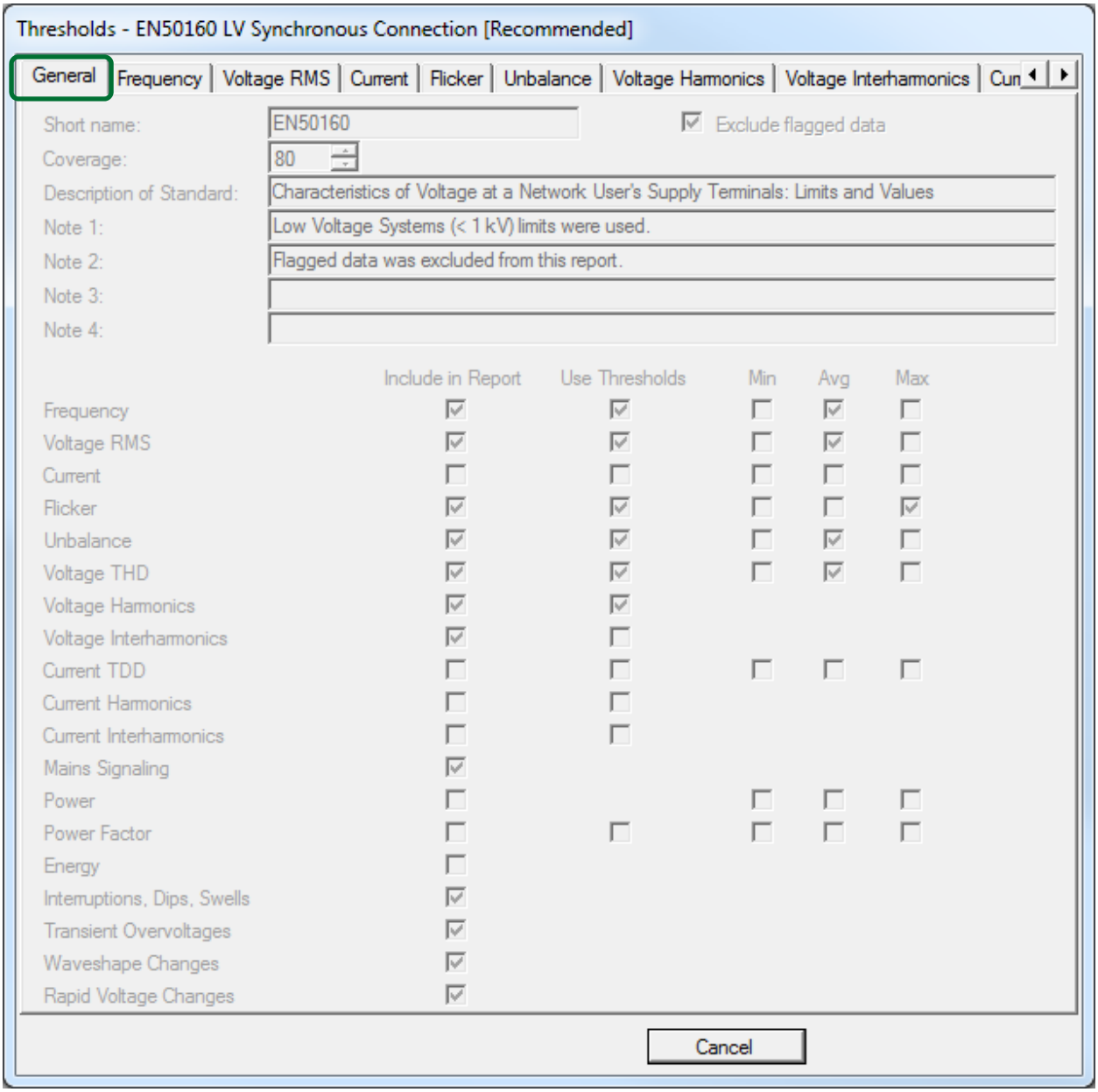
Choose an EN50160 standard

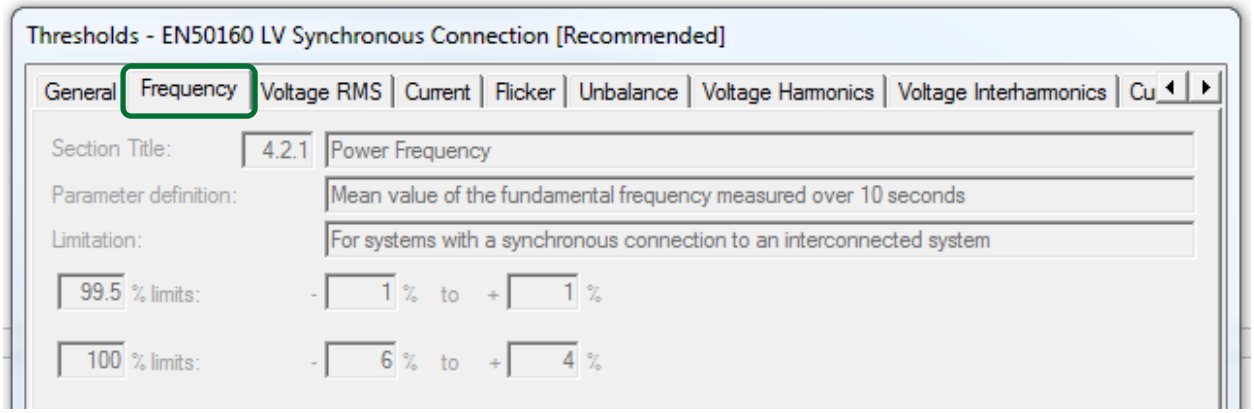
Click on the drop-down list to select from one of the pre-defined standards. The six versions of the EN50160 Standard included are: Low Voltage, Medium Voltage, and High Voltage, and, each in a Synchronous Connection or Island Connection mode.

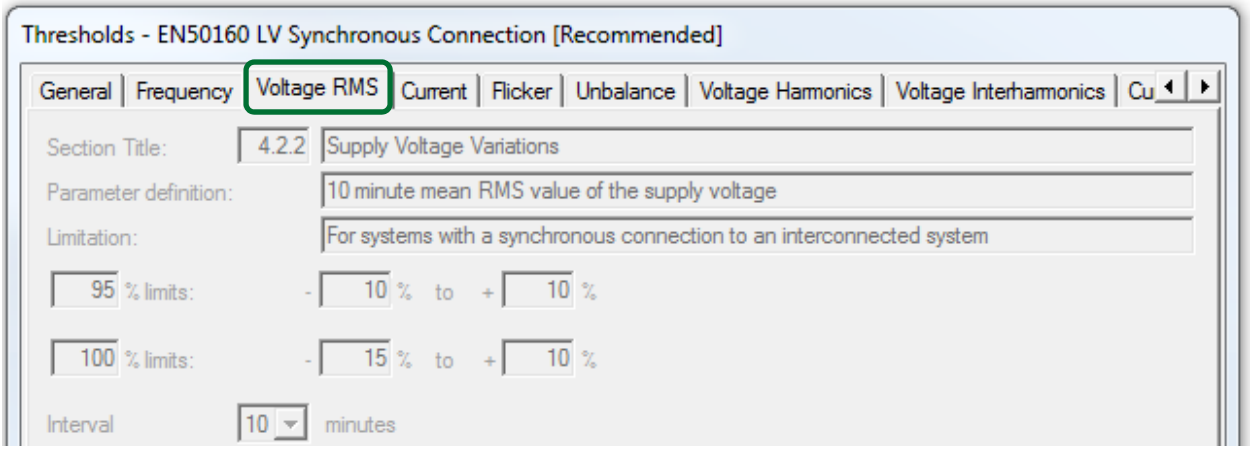
Thresholds, limits, parameters are pre-defined and cannot be edited (grayed out). To view the thresholds, click on the **View Thresholds** button.

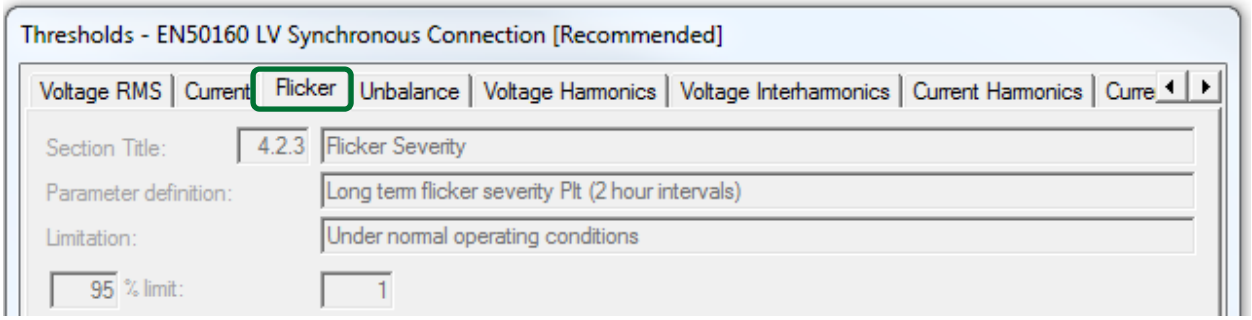


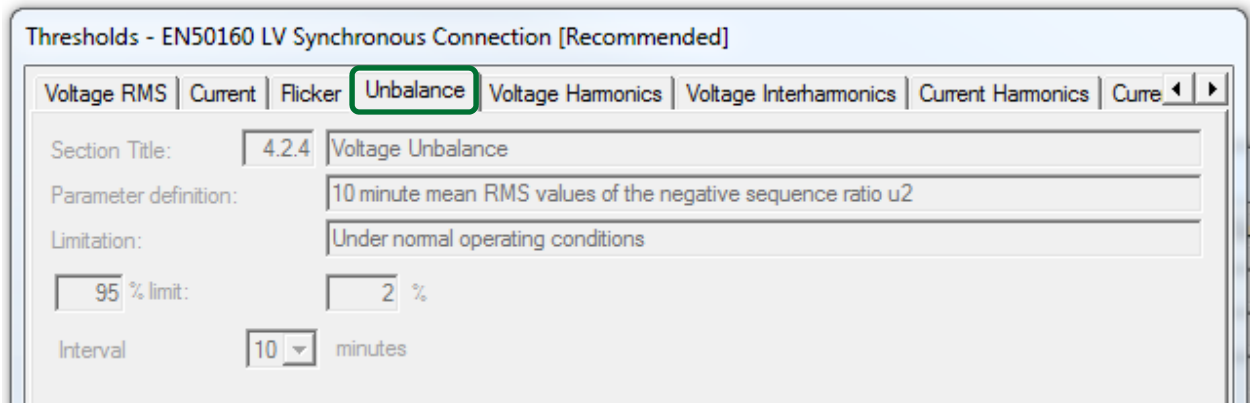
The first screen that appears are your “General” settings for the **EN50160 standard**. Here you’ll find what parameters are included in your report. To get more details, click on each tab to display the EN50160 defined limits and thresholds for each individual parameter. Note that the limits and thresholds are pre-defined per EN50160 standards and cannot be edited.

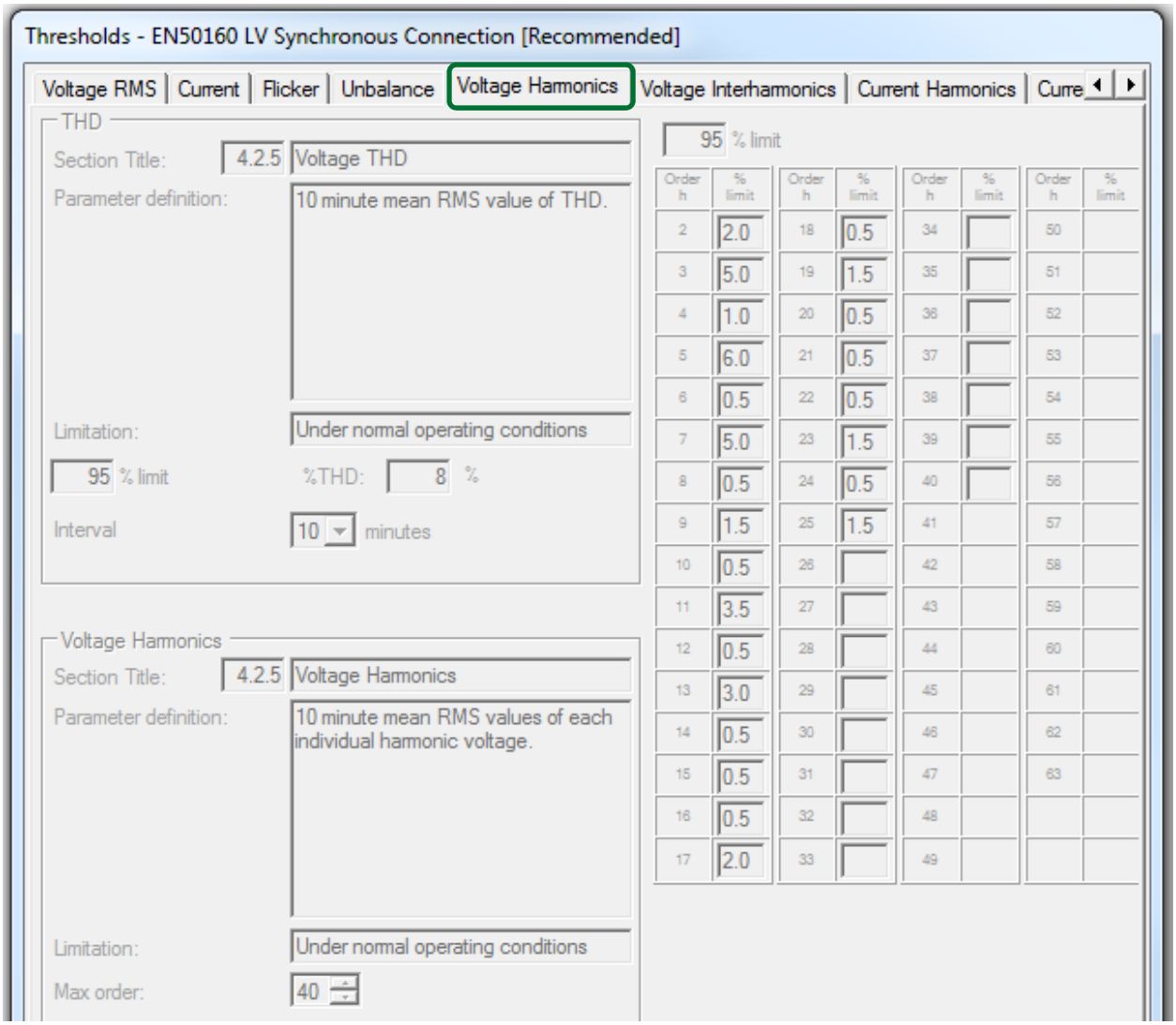


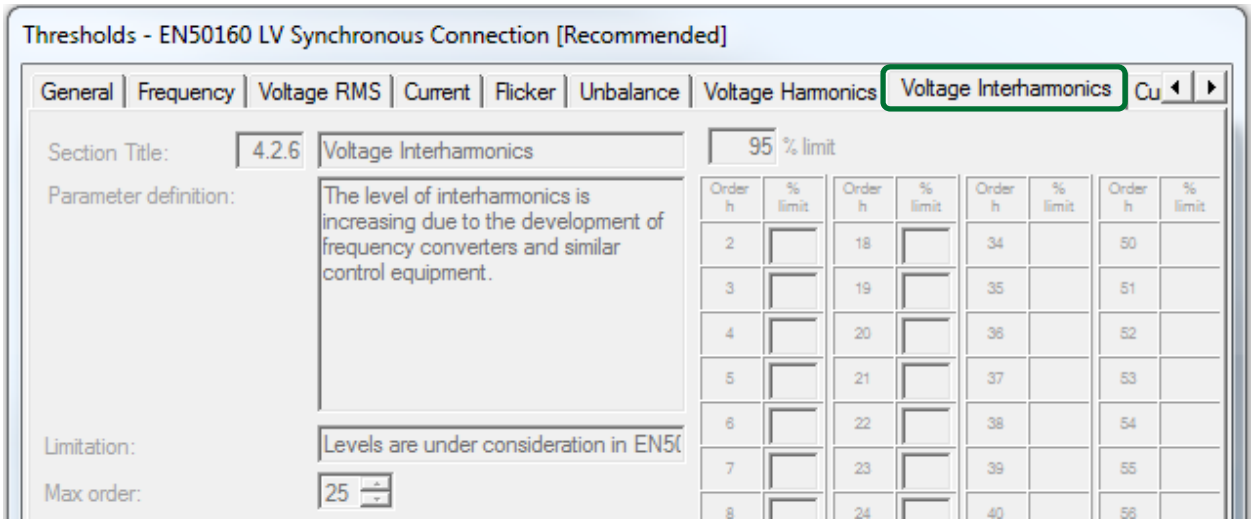

Thresholds - EN50160 LV Synchronous Connection [Recommended]
General
Frequency
Voltage RMS
Current
Flicker
Unbalance
Voltage Harmonics
Voltage Interharmonics
Section Title: 4.2.1 Power Frequency
Parameter definition: Mean value of the fundamental frequency measured over 10 seconds
Limitation: For systems with a synchronous connection to an interconnected system
99.5 % limits: - 1 % to + 1 %
100 % limits: - 6 % to + 4 %


Thresholds - EN50160 LV Synchronous Connection [Recommended]
General
Frequency
Voltage RMS
Current
Flicker
Unbalance
Voltage Harmonics
Voltage Interharmonics
Section Title: 4.2.2 Supply Voltage Variations
Parameter definition: 10 minute mean RMS value of the supply voltage
Limitation: For systems with a synchronous connection to an interconnected system
95 % limits: - 10 % to + 10 %
100 % limits: - 15 % to + 10 %
Interval 10 minutes


Thresholds - EN50160 LV Synchronous Connection [Recommended]
Voltage RMS
Current
Flicker
Unbalance
Voltage Harmonics
Voltage Interharmonics
Current Harmonics
Section Title: 4.2.3 Flicker Severity
Parameter definition: Long term flicker severity Plt (2 hour intervals)
Limitation: Under normal operating conditions
95 % limit: 1


Thresholds - EN50160 LV Synchronous Connection [Recommended]
Voltage RMS
Current
Flicker
Unbalance
Voltage Harmonics
Voltage Interharmonics
Current Harmonics
Section Title: 4.2.4 Voltage Unbalance
Parameter definition: 10 minute mean RMS values of the negative sequence ratio u2
Limitation: Under normal operating conditions
95 % limit: 2 %
Interval 10 minutes


Thresholds - EN50160 LV Synchronous Connection [Recommended]
Voltage RMS
Current
Flicker
Unbalance
Voltage Harmonics
Voltage Interharmonics
Current Harmonics
THD
Section Title: 4.2.5 Voltage THD
Parameter definition: 10 minute mean RMS value of THD.
Limitation: Under normal operating conditions
95 % limit
%THD: 8 %
Interval 10 minutes
Voltage Harmonics
Section Title: 4.2.5 Voltage Harmonics
Parameter definition: 10 minute mean RMS values of each individual harmonic voltage.
Limitation: Under normal operating conditions
Max order: 40
95 % limit
Order h
% limit


Thresholds - EN50160 LV Synchronous Connection [Recommended]
General
Frequency
Voltage RMS
Current
Flicker
Unbalance
Voltage Harmonics
Voltage Interharmonics
Section Title: 4.2.6 Voltage Interharmonics
Parameter definition: The level of interharmonics is increasing due to the development of frequency converters and similar control equipment.
Limitation: Levels are under consideration in EN5(
Max order: 25
95 % limit
Order h
% limit

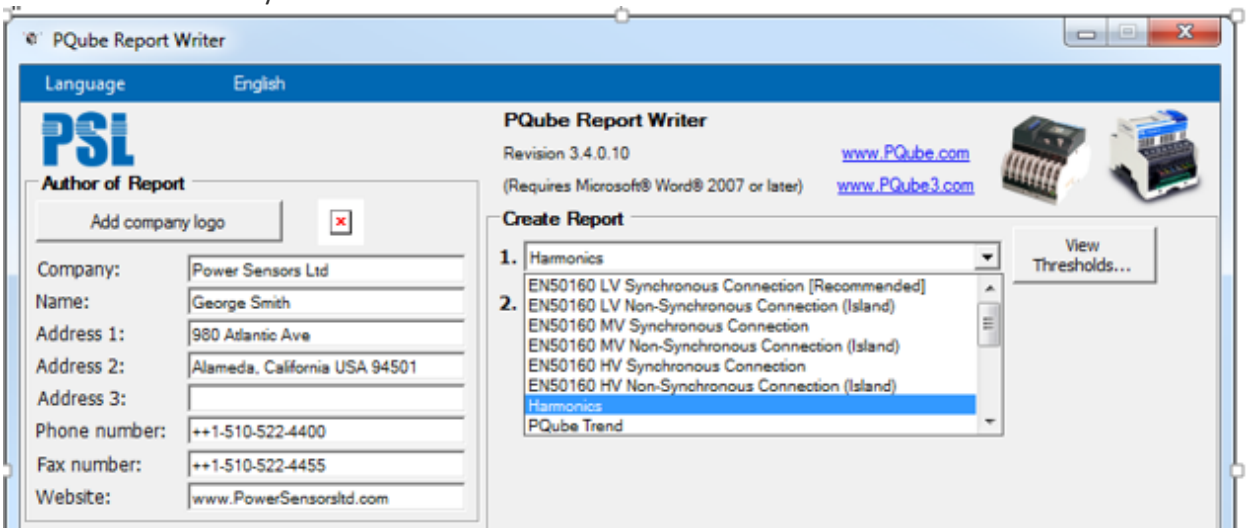
Choose a non-EN50160 standard

If you are not interested in an EN50160 compliance report, the PQube® Report Writer program comes pre-loaded with other types of reports (Harmonics, Energy, PQube Trends) to help you understand and analyze your power.

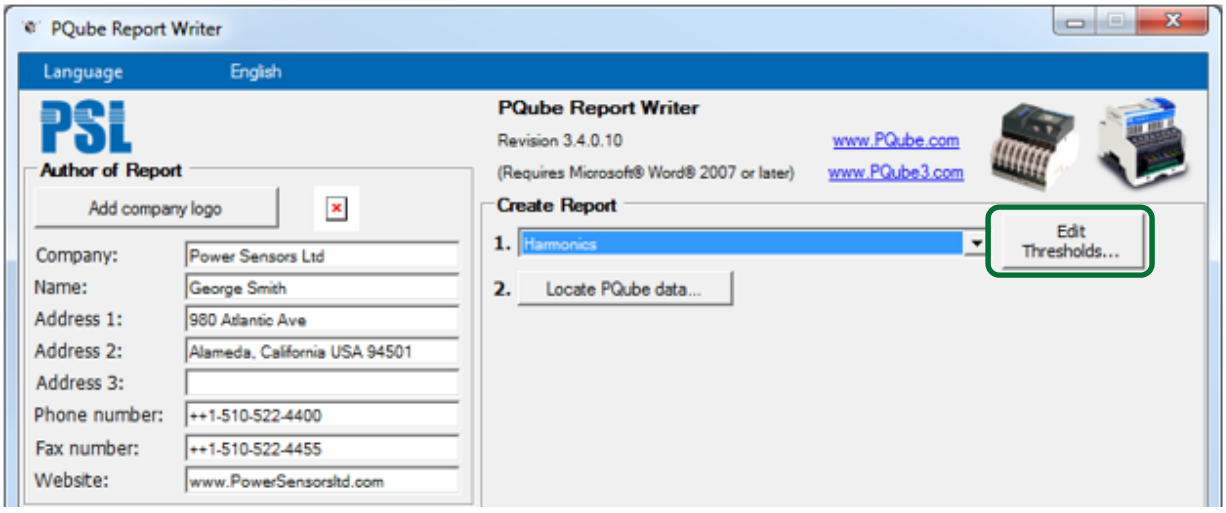
Unlike the EN50160 reports which are fixed, you can choose which parameters to include/exclude in your report and whether to Use Thresholds. By default, "Use Thresholds" are unselected and will generate a DATA ONLY report. If you want to generate a PASS/FAIL compliance type report ***and*** customize your limits and threshold settings, you need to enable "Use Thresholds" for each parameter.

Harmonics standard

Want to take a look at your individual Harmonic levels? **Choose the Harmonics standard**.

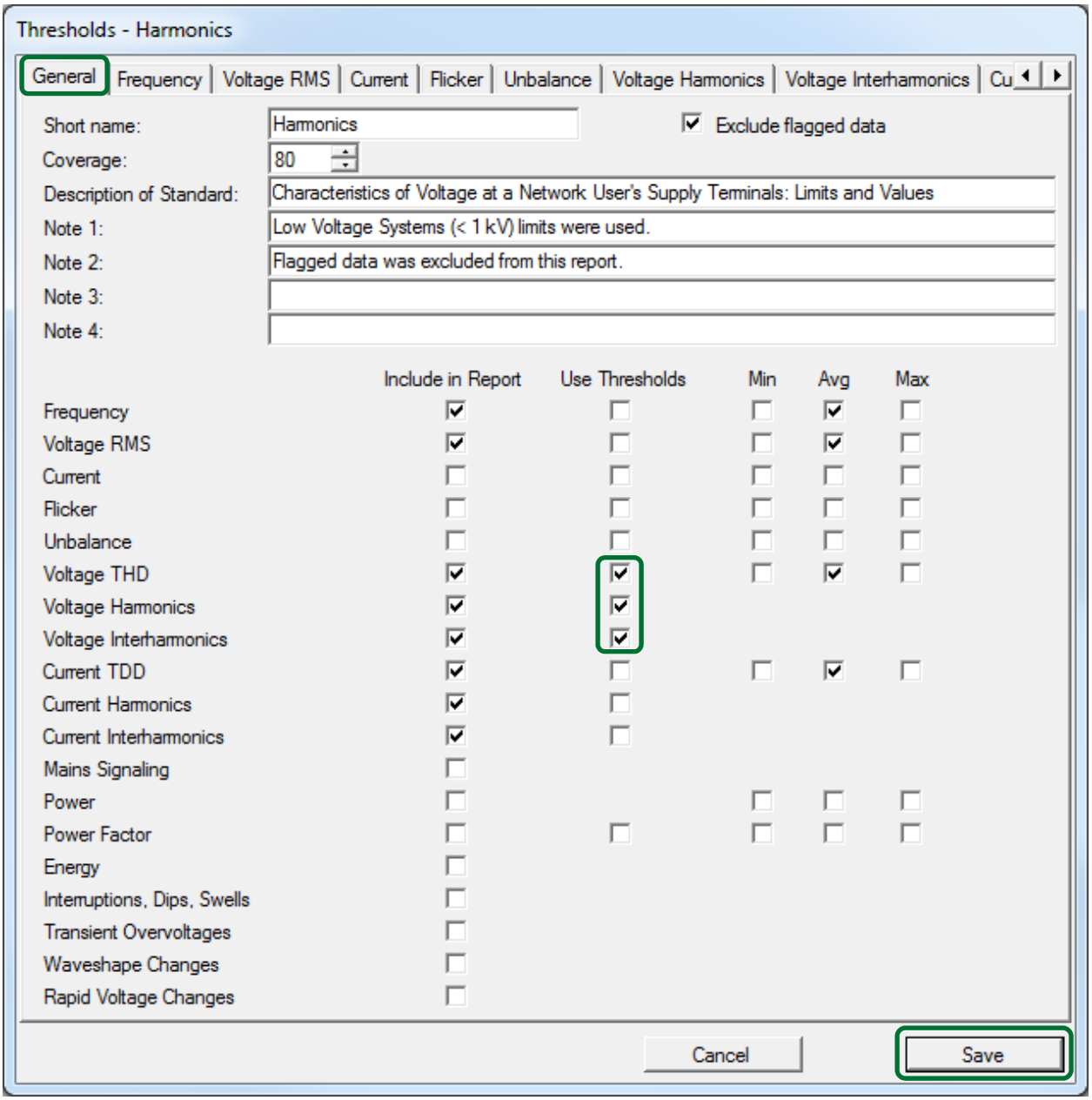


To view/edit your thresholds, click on the **Edit Thresholds** button.

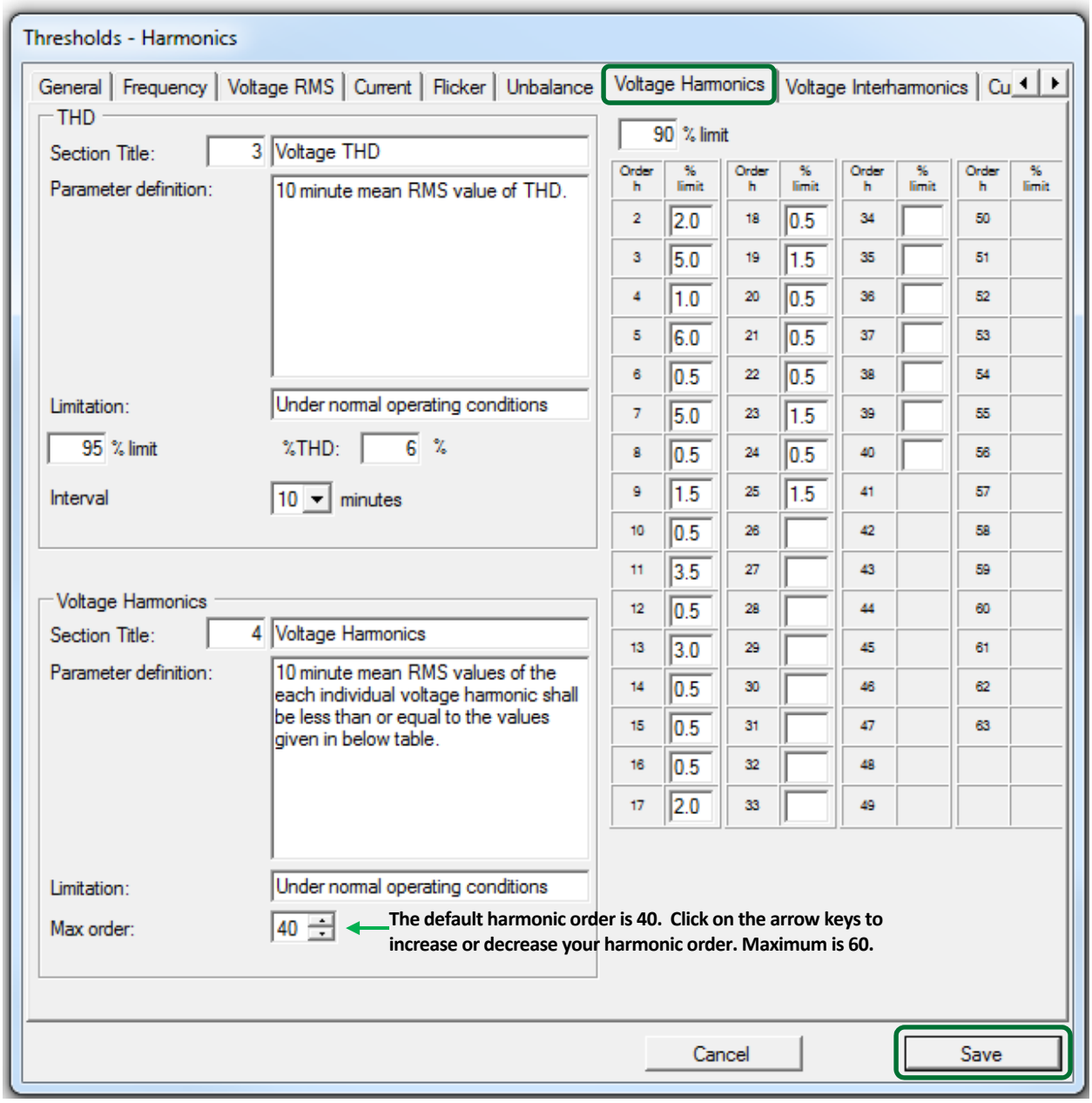


The first screen that appears are your "General" settings for **Harmonics**. You can edit your coverage (in %), choose whether to exclude/include flagged data[2] and edit the title/notes of your report.

By default, "Use Thresholds" are disabled and will generate a DATA ONLY report. If you prefer to generate a PASS/FAIL report, enable "Use Thresholds". You can use the existing pre-defined thresholds and limits or define your own! To create your own thresholds and limits, click on the tab for each parameter where "Use Thresholds" is enabled and simply enter your values.



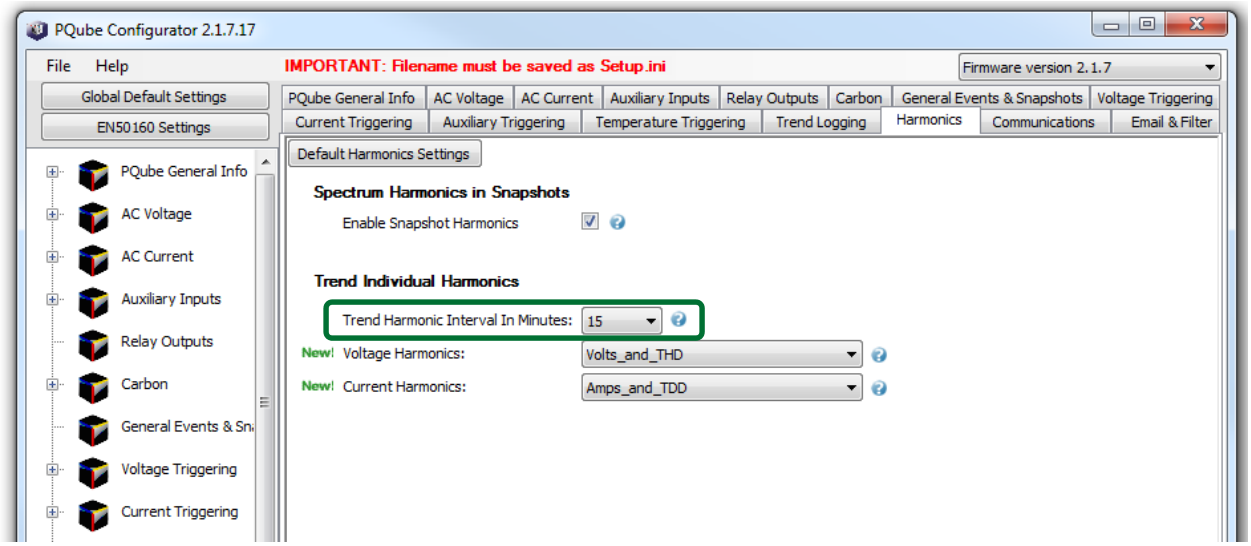
[2]flagged data is defined as IEC 61000-4-30events such as voltage sags, swells, interruptions, HF impulses, waveshape changes and Rapid Voltage Changes.



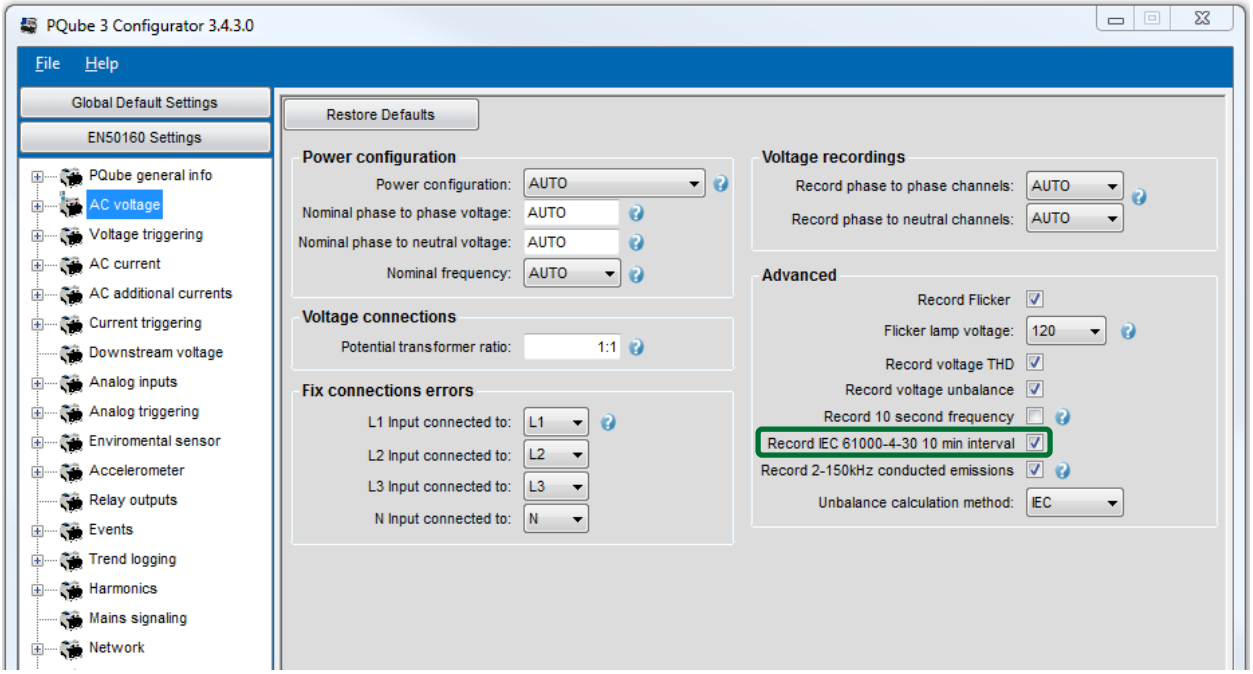
Be sure to click on the **Save** button to save your settings.

Important: To include Harmonics data in your report, you MUST enable the following tags in your PQube's Setup.ini file ***prior*** to measuring and recording data. This will generate the individual files the Report Writer uses to report your Harmonics coverage in addition to the individual Harmonics values.

- **Trend Harmonic Interval In Minutes = 10 or 15 min (for PQube Classic)**

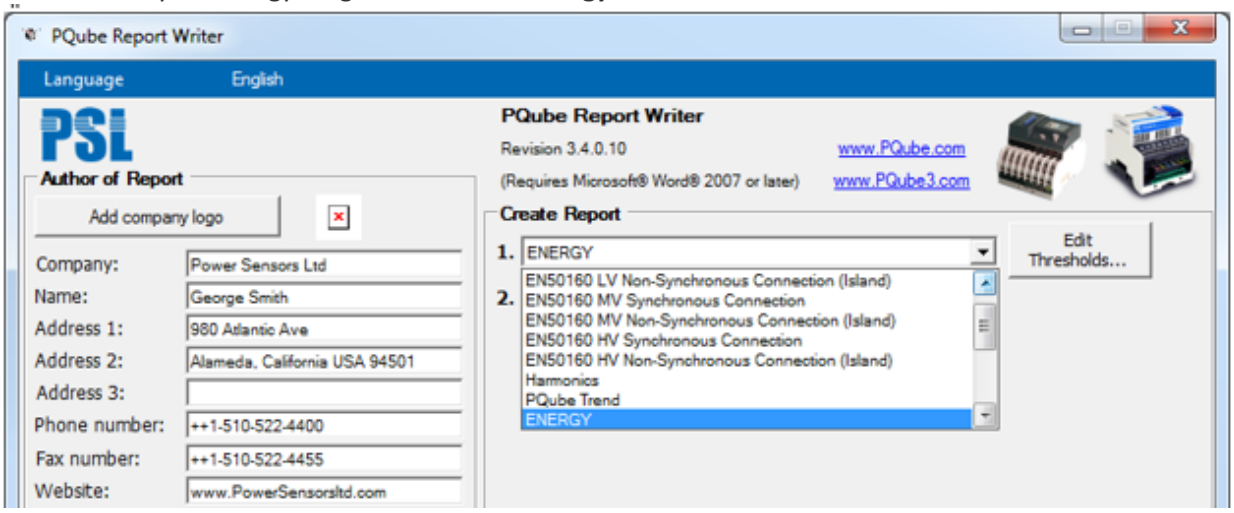


- **Record IEC 61000-4-30 10 min. interval = ON (for PQube 3)**

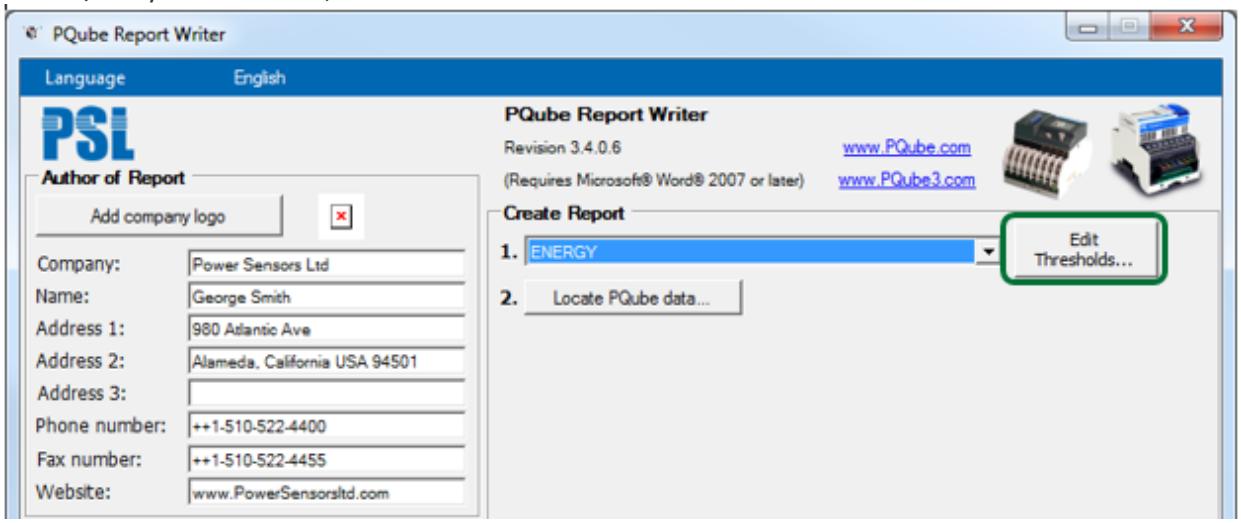


Energy standard

Want to view your Energy usage? **Choose the Energy standard**.

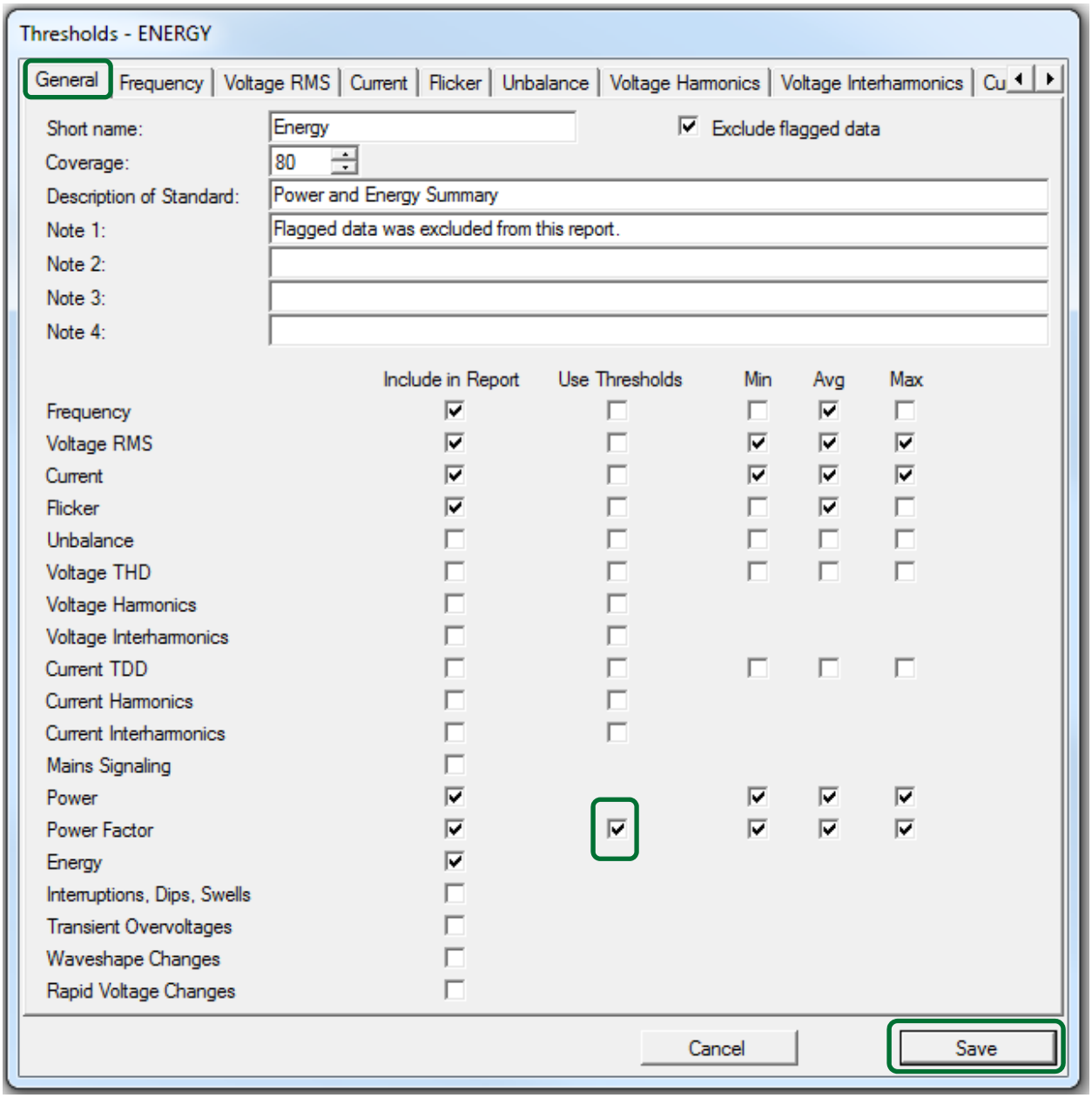


To view/edit your thresholds, click on the **Edit Thresholds** button.

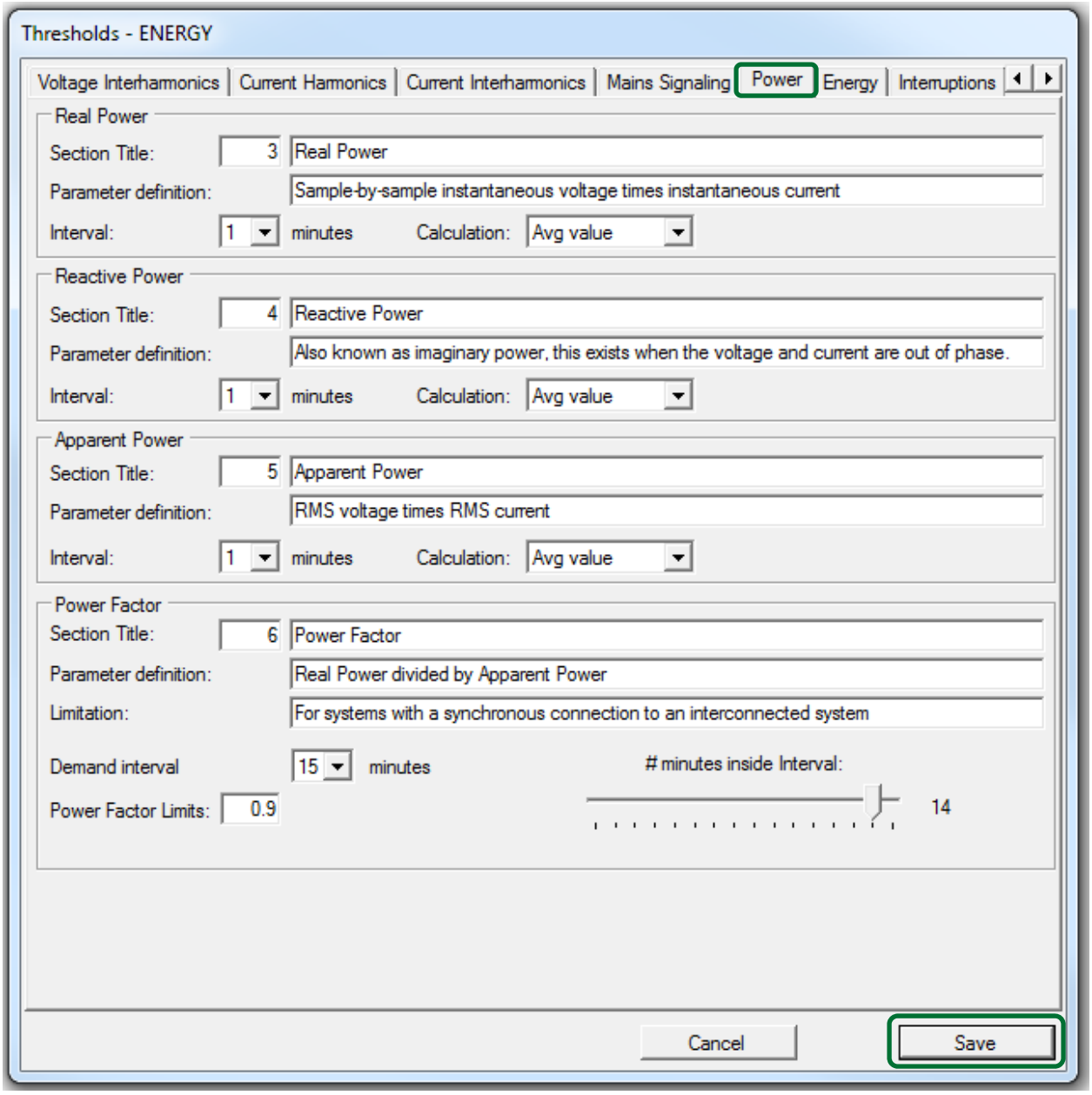


The first screen that appears are your "General" settings for **Energy**. You can edit your coverage (in %), choose whether to exclude/include flagged data[2] and edit the title/notes of your report.

By default, "Use Thresholds" are disabled and will generate a DATA ONLY report. If you prefer to generate a PASS/FAIL report, enable "Use Thresholds". You can use the existing pre-defined thresholds and limits or define your own! To create your own thresholds and limits, click on the tab for each parameter where "Use Thresholds" is enabled and simply enter your values.



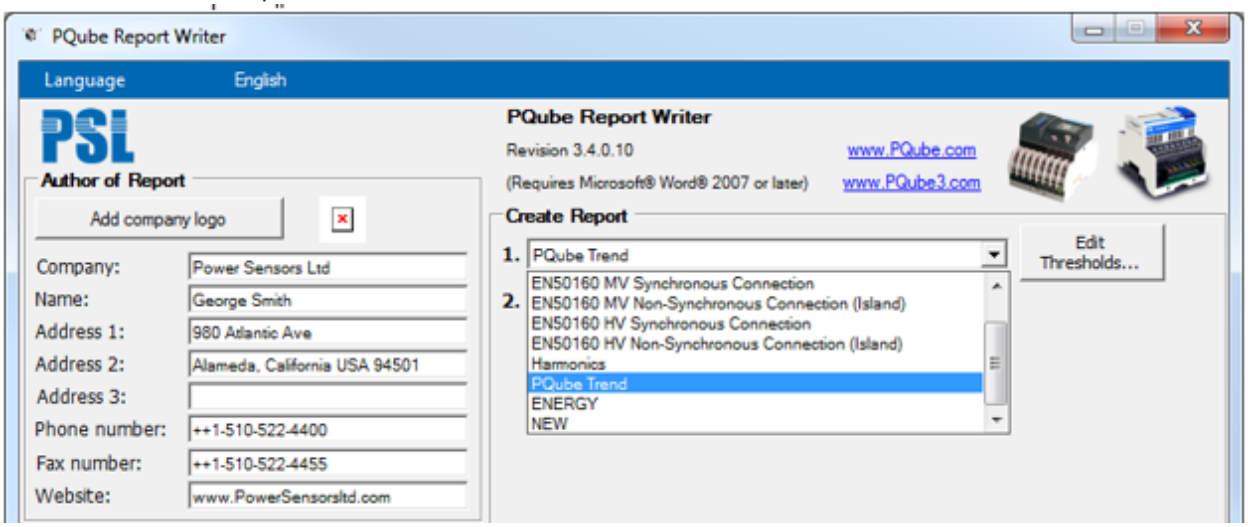
[2]flagged data is defined as IEC 61000-4-30events such as voltage sags, swells, interruptions, HF impulses, waveshape changes and Rapid Voltage Changes.



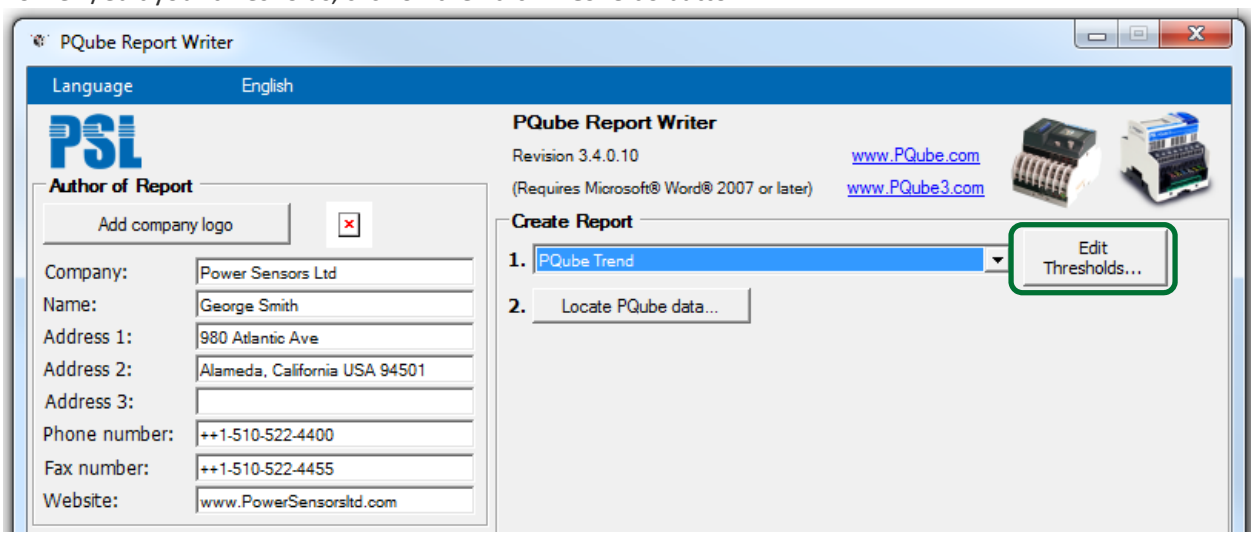
Be sure to click on the **Save** button to save your settings.

PQube Trend standard

Want it all? **Choose the PQube Trend standard**. This report takes all the parameters and combines it into one convenient report!

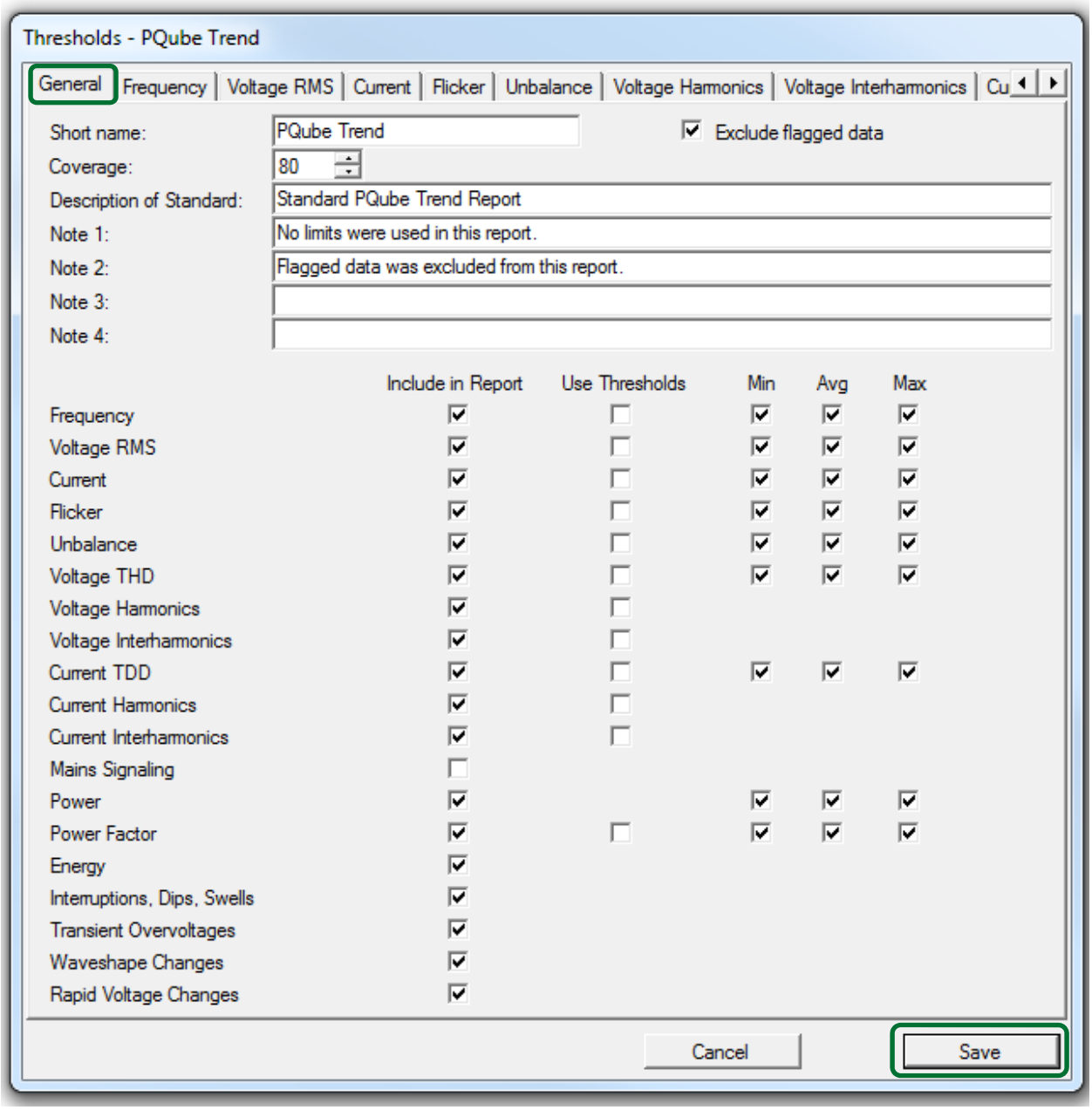


To view/edit your thresholds, click on the **Edit Thresholds** button.

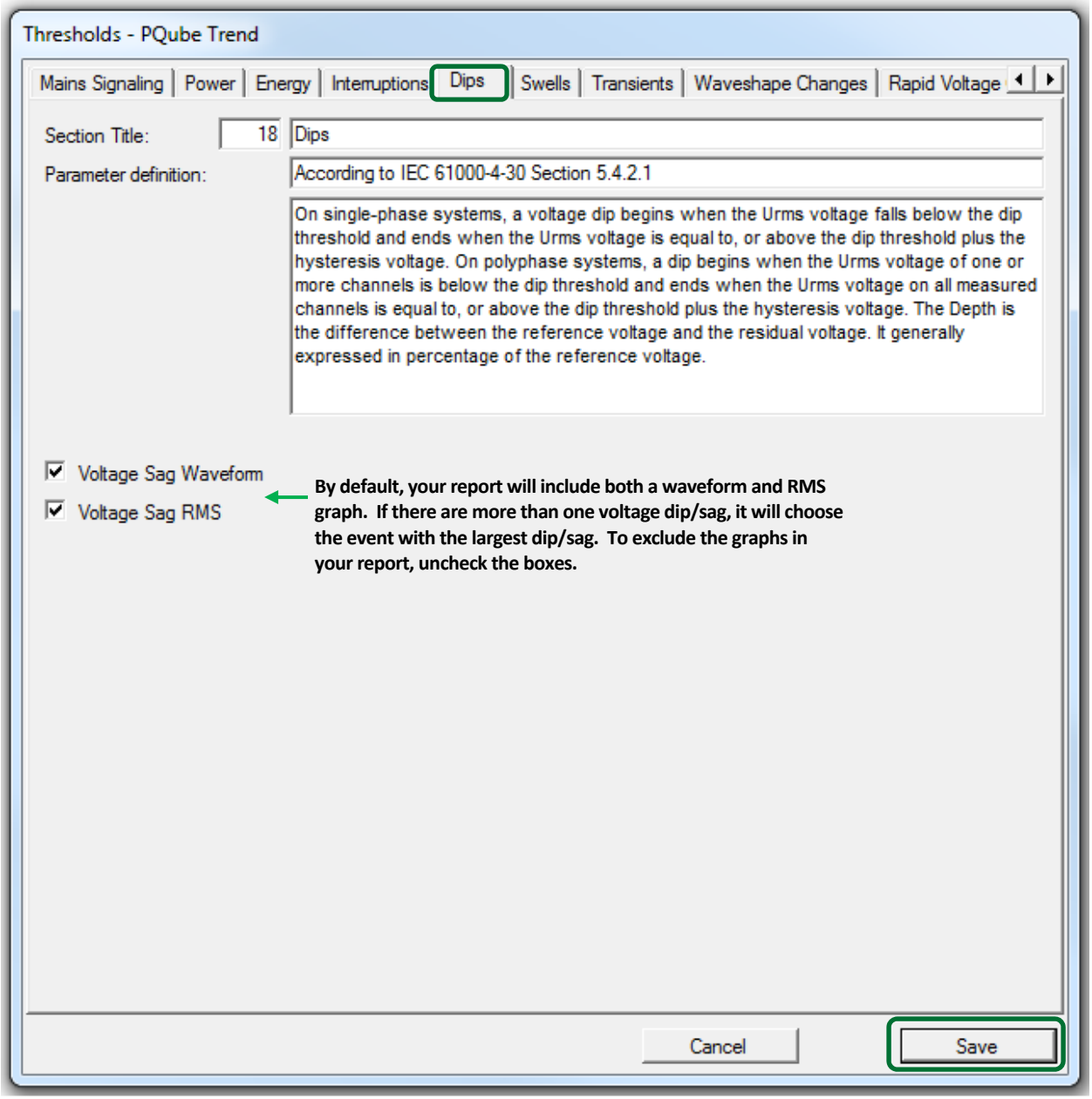


The first screen that appears are your "General" settings for **PQube Trend**. You can edit your Coverage (in %), choose whether to exclude/include flagged data[2] and edit the title/notes of your report.

By default, "Use Thresholds" are disabled and will generate a DATA ONLY report. If you prefer to generate a PASS/FAIL report, enable "Use Thresholds". You can use the existing pre-defined thresholds and limits or define your own! To create your own thresholds and limits, click on the tab for each parameter where "Use Thresholds" is enabled and simply enter your values.



[2]flagged data is defined as IEC 61000-4-30events such as voltage sags, swells, interruptions, HF impulses, waveshape changes and Rapid Voltage Changes.



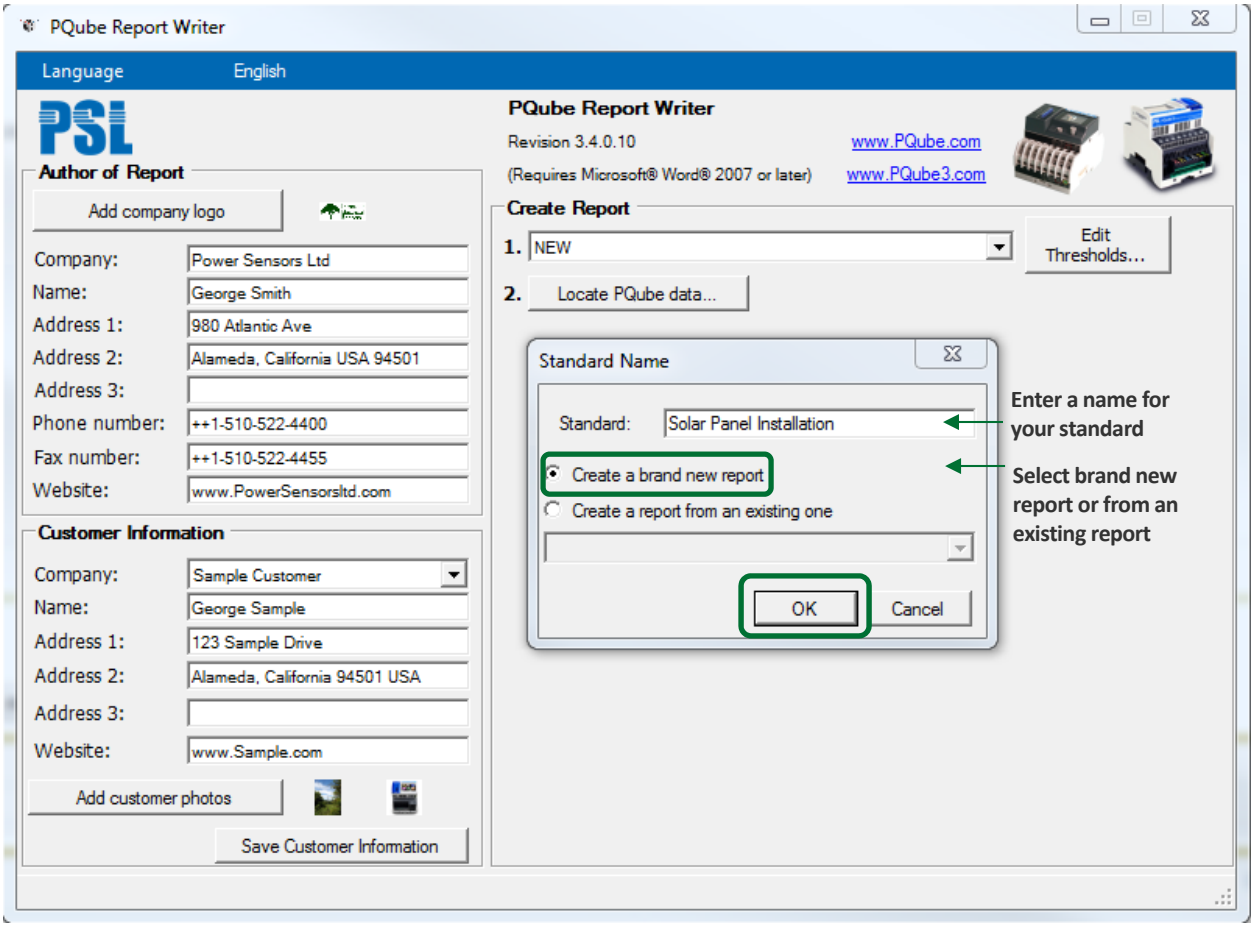
Be sure to click on the **Save** button to save your settings.

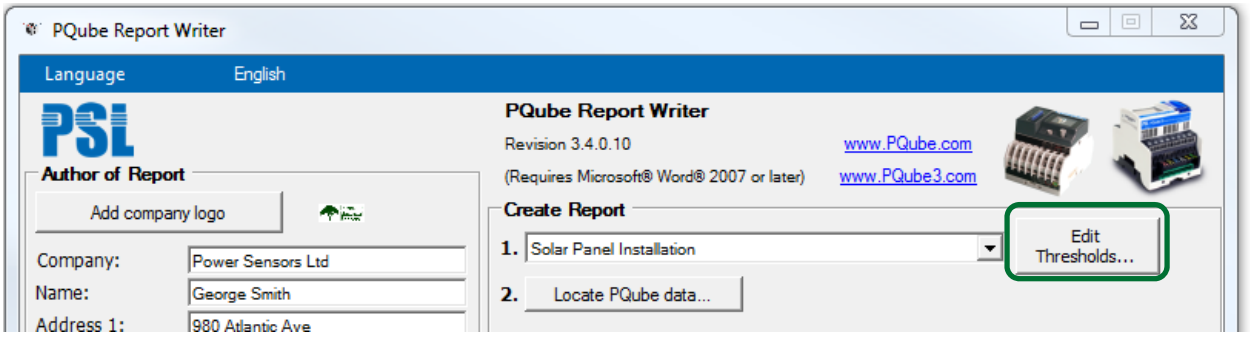
Create a NEW standard

Want to start from scratch and create a brand new report? You can customize everything from defining your own limits, percent coverage, choosing which power parameters to include/exclude in your report and choose whether or not to "Use Thresholds" in your report.

Click on the drop-down list, select **NEW,** and choose from one of the following options:

- "Create a brand new report"
- "Create a report from an existing one"



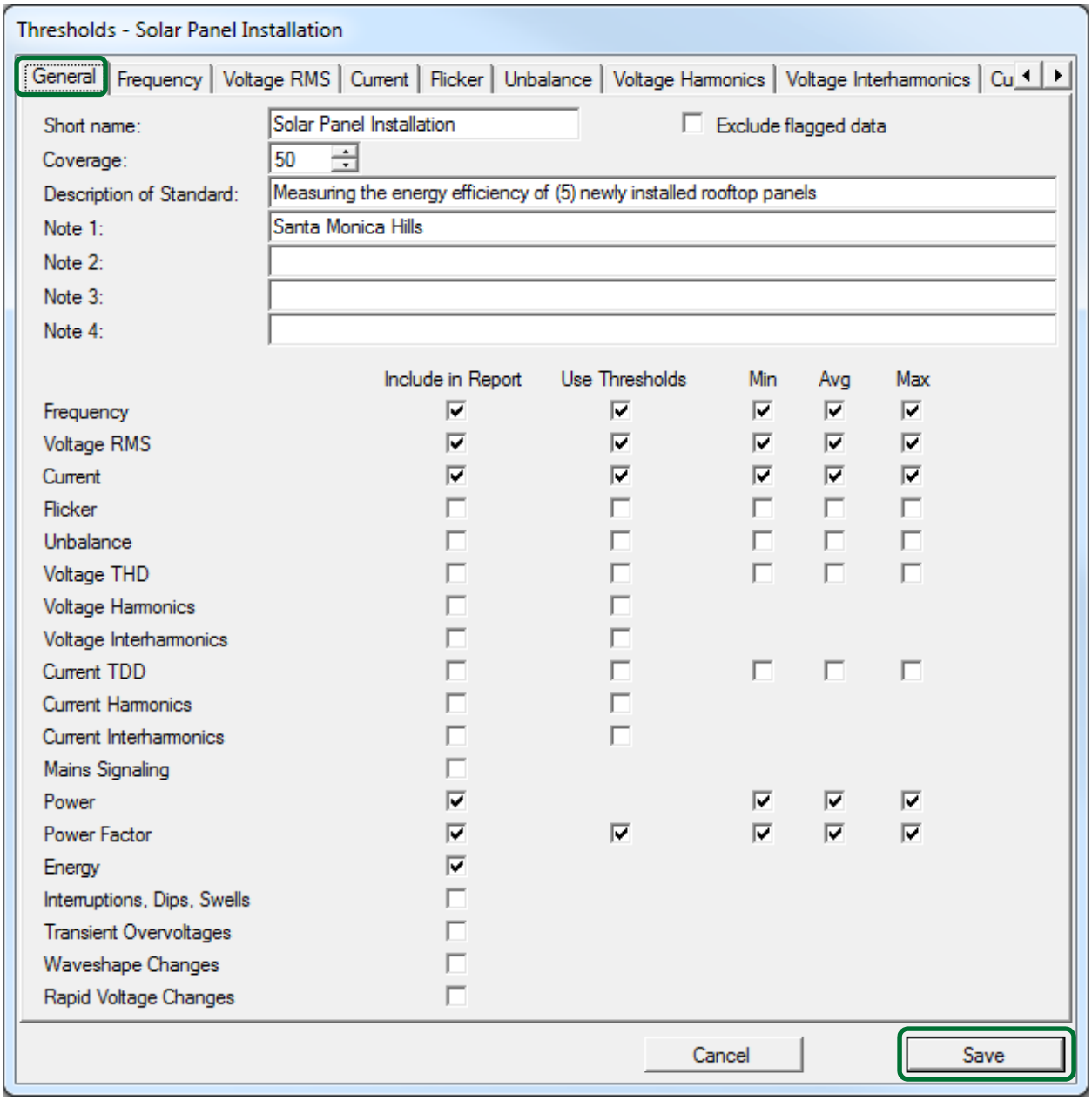


To view/edit your thresholds, click on the **Edit Thresholds** button.

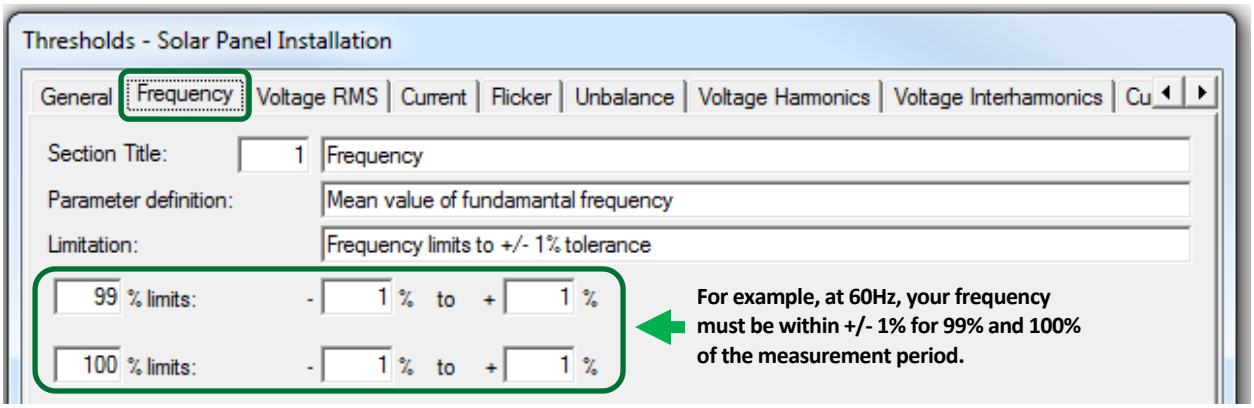
Edit Thresholds for your new standard

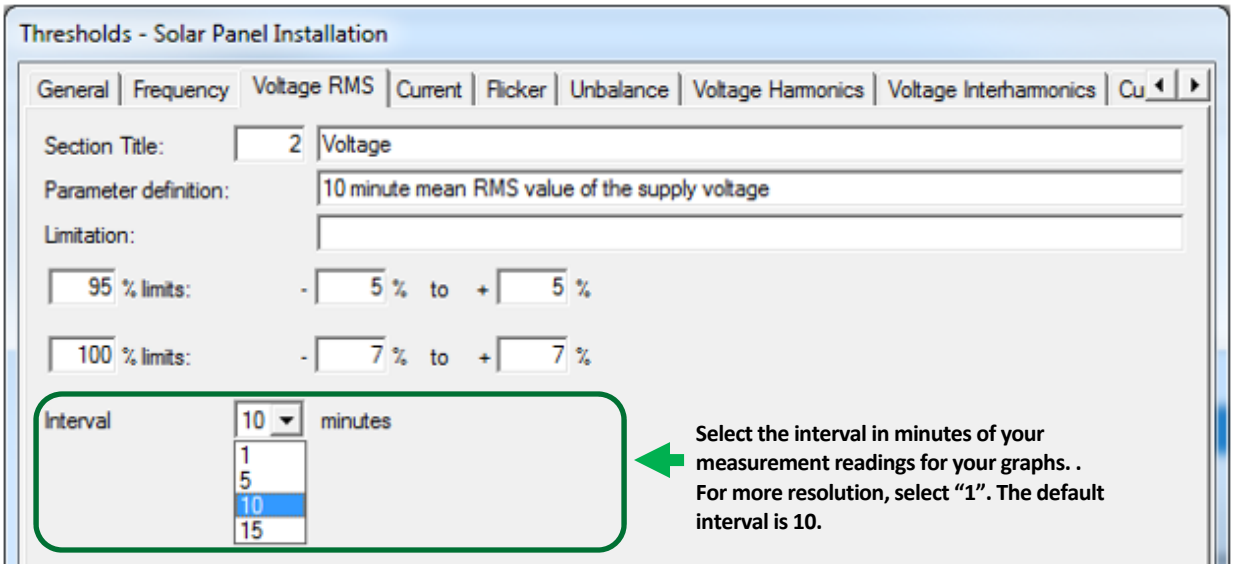
The first screen that will appear are your General settings. It will be completely blank. Select each parameter to include in your report. Then click on the corresponding tabs to customize your settings for each of those parameters.

If you are interested in setting your own %limits and thresholds for compliance measurement, click on **"Use Thresholds"** for each parameter *and* select "Min", "Avg" and/or "Max".



Enabling the “Use Thresholds” tag allows you to set your %limits and %tolerances; %THD and 5 minute incremental intervals (up to 15 minutes) for other parameters. In addition, you can number your sections, add titles and your own descriptions to your report.





Power Sensors Ltd
980 Atlantic Ave
Alameda, California USA 94501
TEL: ++1-510-522-4400
FAX: ++1-510-522-4455
http://www.PowerSensorsltd.com

Sample Report from the PQube® Report Writer

EN50160 Compliance Report - **PASS**

1/25/2016 – 1/31/2016
"Characteristics of Voltage at a Network User's Supply Terminals: Limits and Values"

Mechanical shock testbed

George Sample
Sample Customer
123 Sample Drive
Alameda, California 94501 USA
http://www.Sample.com

1-phase 2-wire Single Phase L1-N
Um=120.00 V/60Hz

Summary of Results
EN50160 Report
1/25/2016 – 1/31/2016

EN50160 Pass-Fail Requirements Table

EN50160 Sect	Power Quality Parameter	EN50160 Compliance	Remarks
4.2.1	Power Frequency	PASS	Coverage 99.69%
4.2.2	Supply Voltage Variations	PASS	Coverage 99.69%
4.2.3	Flicker Severity	PASS	Coverage 92.16%
4.2.4	Voltage Unbalance	N/A	Unbalance does not apply for this power configuration
4.2.5	Voltage THD	PASS	
4.2.5	Voltage Harmonics	PASS	

EN50160 Additional Information Table

EN50160 Section	Power Quality Parameter	Remarks
4.2.6	Voltage Interharmonics	
4.2.7	Mains Signaling	Not measured
4.3.1	Interruptions	
4.3.2	Dips	
4.3.3	Swells	
4.3.4	Transient Overvoltages	
4.3.5	Waveshape Changes	

Note 1: During 1/25/2016 – 1/31/2016 measurements were made 99.69% of the time
Note 2: Low Voltage Systems (< 1 kV) limits were used.
Note 3: Flagged data was excluded from this report.

Instrument used:	PQube3® (www.PQube3.com)
Manufacturer:	Power Sensors Ltd, U.S.A.
PQube ID:	Mechanical shock testbed
Location:	Intratech SEMICONDUCTORS
Serial number:	P3001523
Firmware revision:	daily_01_27_2016_1927
Calibration Certificate:	http://www.PowerStandards.com/CalibCerts/P3001523.pdf
Report Software:	PQube Report Writer 3.4.0.10
Author of Report:	Power Sensors Ltd
Name:	George Smith

Customer Information

Name:	George Sample
Company:	Sample Customer
Address 1:	123 Sample Drive
Address 2:	Alameda, California 94501 USA
Address 3:	
Website:	http://www.Sample.com

Mechanical shock testbed - 1/25/2016 – 1/31/2016

Photo 1 - photo1

Photo 2 - photo2

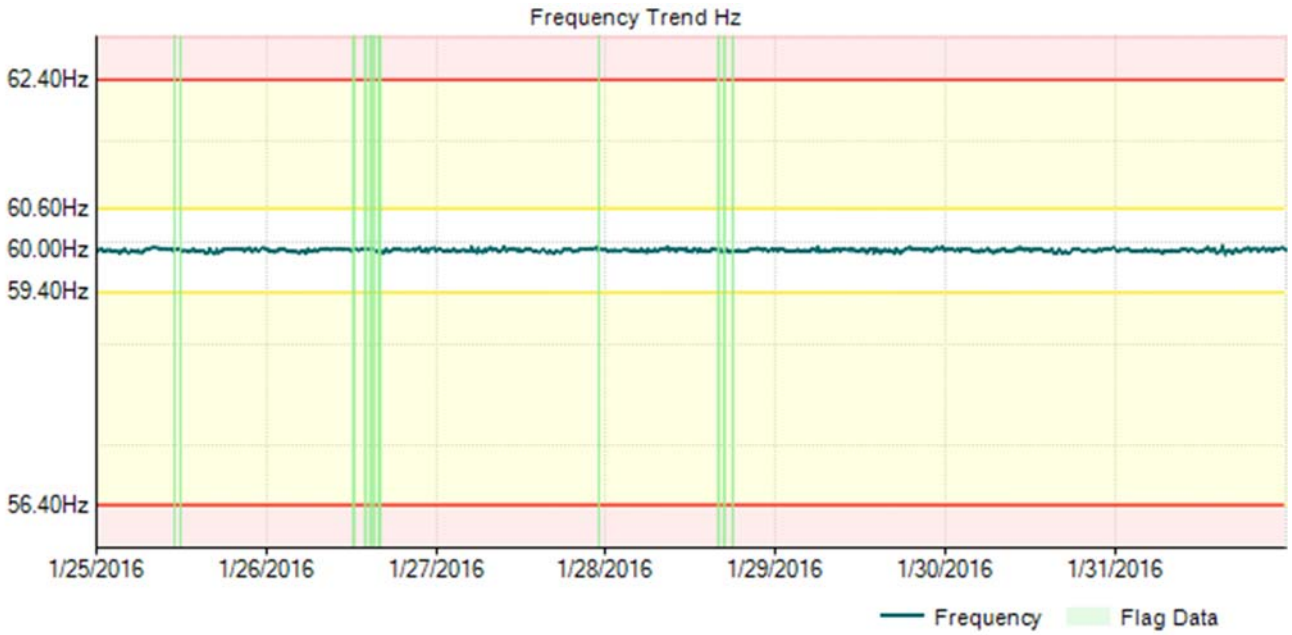
EN50160 Section 4.2.1: Power Frequency

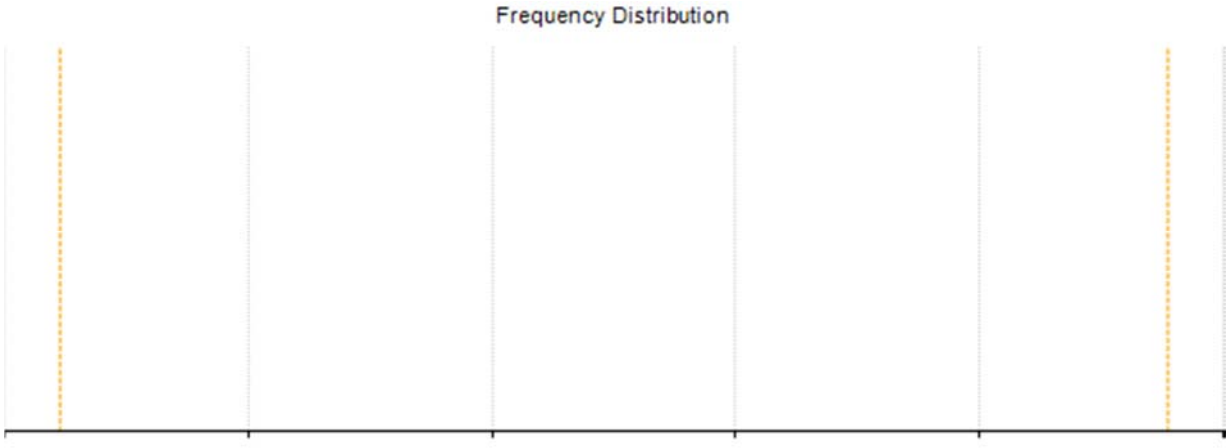
Nominal Frequency : **60.00Hz**

Parameter definition: Mean value of the fundamental frequency measured over 10 seconds

Limitation: For systems with a synchronous connection to an interconnected system

EN50160 Requirement	**Measured Frequency**	**Result**
99.5% of the time: 59.40Hz - 60.60Hz	**59.95Hz~60.04Hz**	**PASS**
100% of the time: 56.40Hz - 62.40Hz	**59.92Hz~60.07Hz**	**PASS**



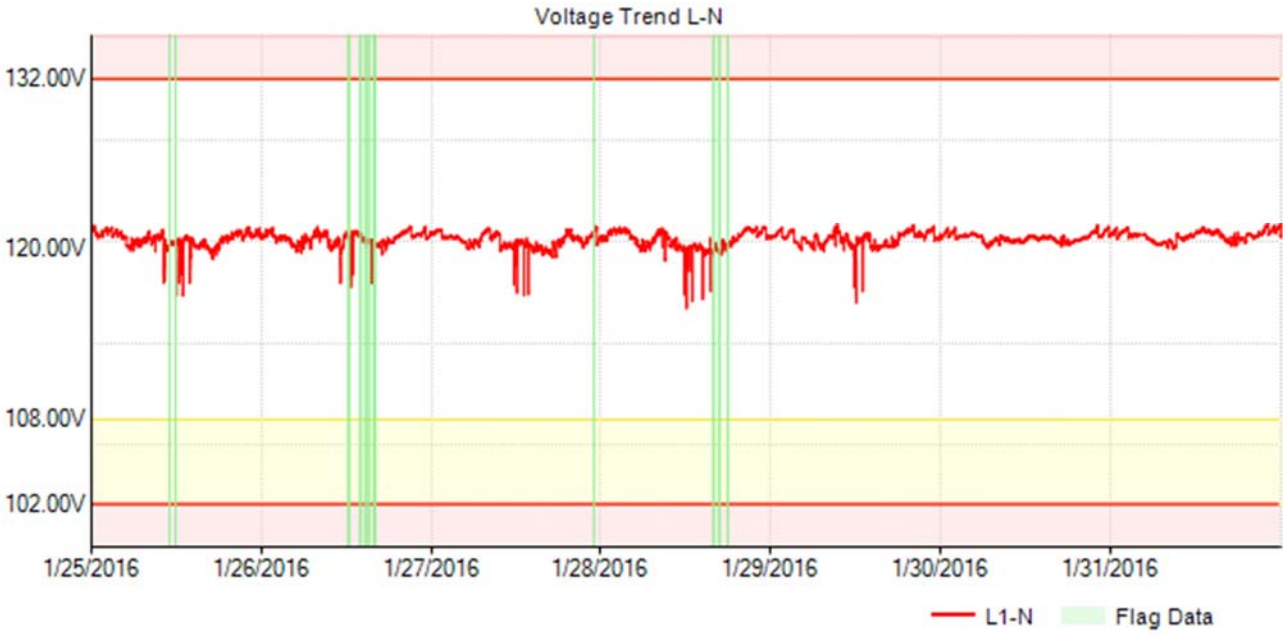


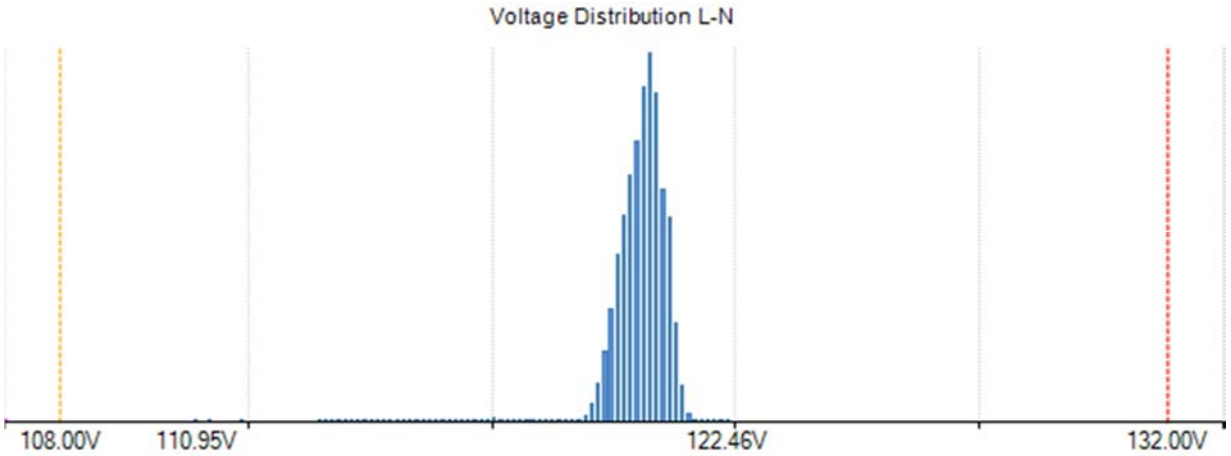
No statistics found in PQube data

EN50160 Section 4.2.2: Supply Voltage Variations

Nominal Voltage :	**120.00V L-N**
Parameter definition:	10 minute mean RMS value of the supply voltage
Limitation:	For systems with a synchronous connection to an interconnected system

EN50160 Requirement	**Measured L1 Voltage**	**Result**
95% of the time: 108.00V - 132.00V	**119.94V~121.36V**	**PASS**
100% of the time: 102.00V - 132.00V	**118.46V~121.65V**	**PASS**



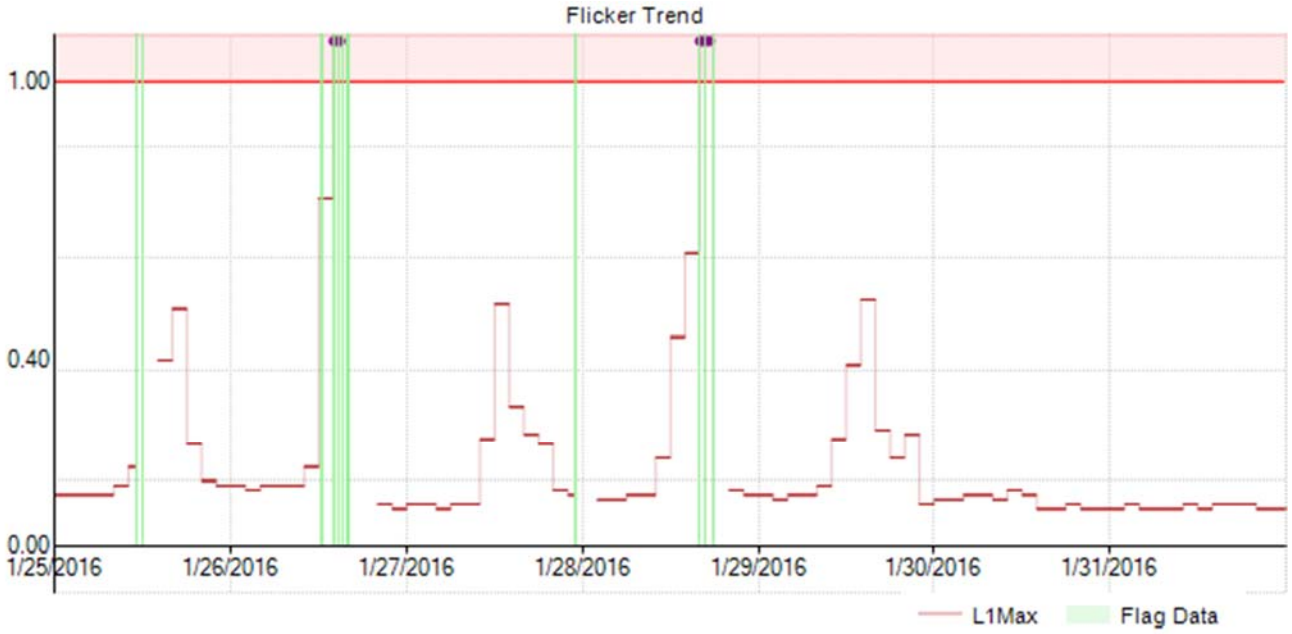


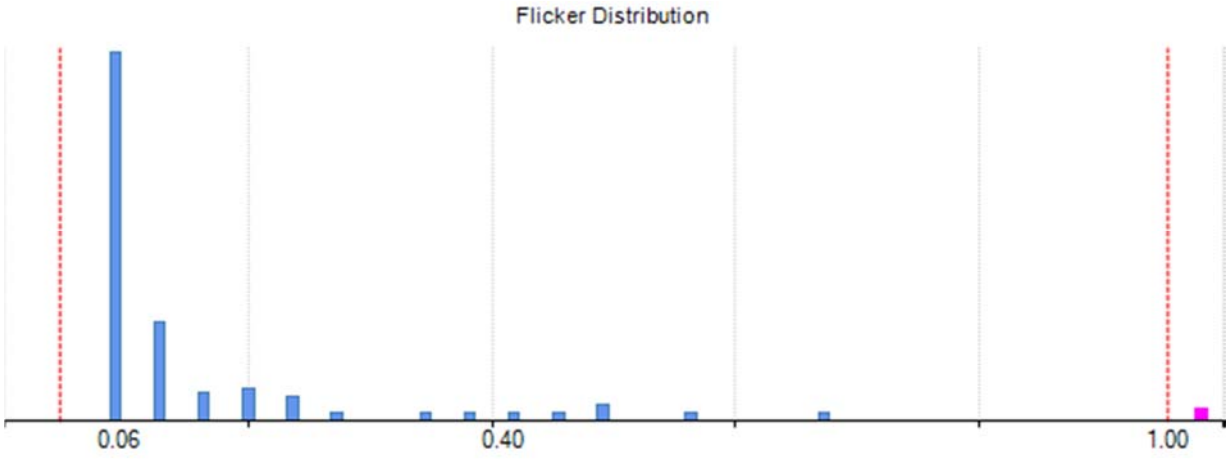
EN50160 Section 4.2.3: Flicker Severity

Parameter definition: Long term flicker severity Plt (2 hour intervals) (Max)

Limitation: Under normal operating conditions

EN50160 Requirement	**Measured L1 Plt**	**Result**
95% of the time: Plt ≤ 1	**0.40**	**PASS**





EN50160 Section 4.2.4: Voltage Unbalance

Parameter definition:	10 minute mean RMS values of the negative sequence ratio u2 (Avg)
Limitation:	Under normal operating conditions

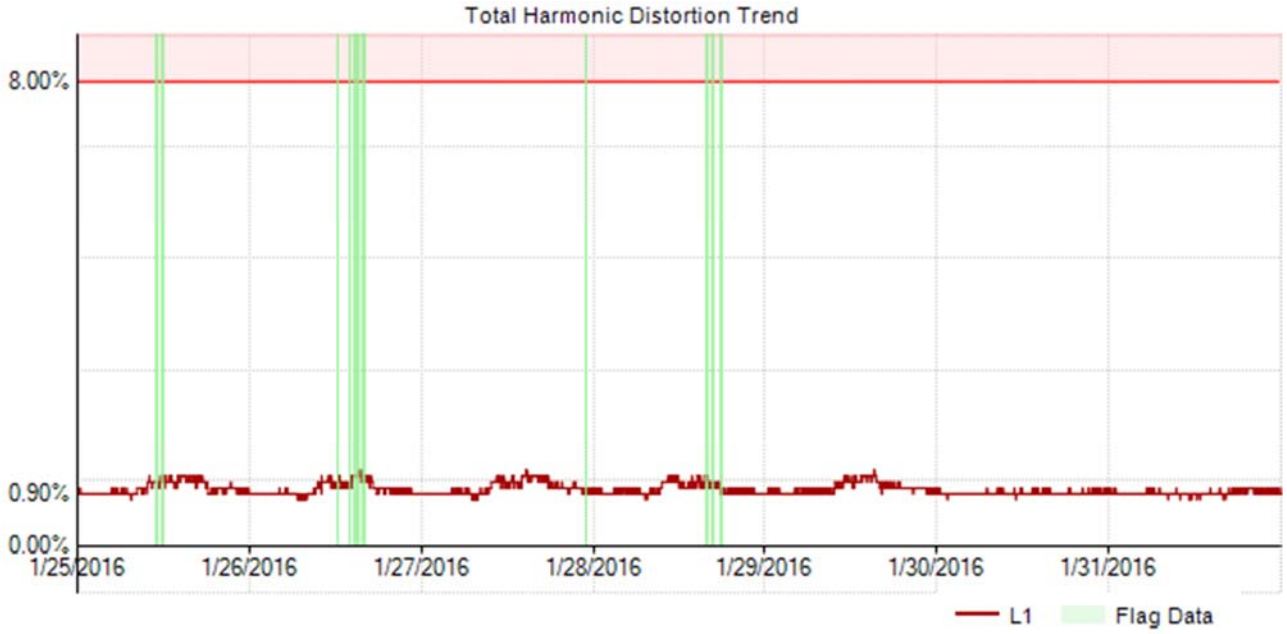
Unbalance does not apply for this power configuration

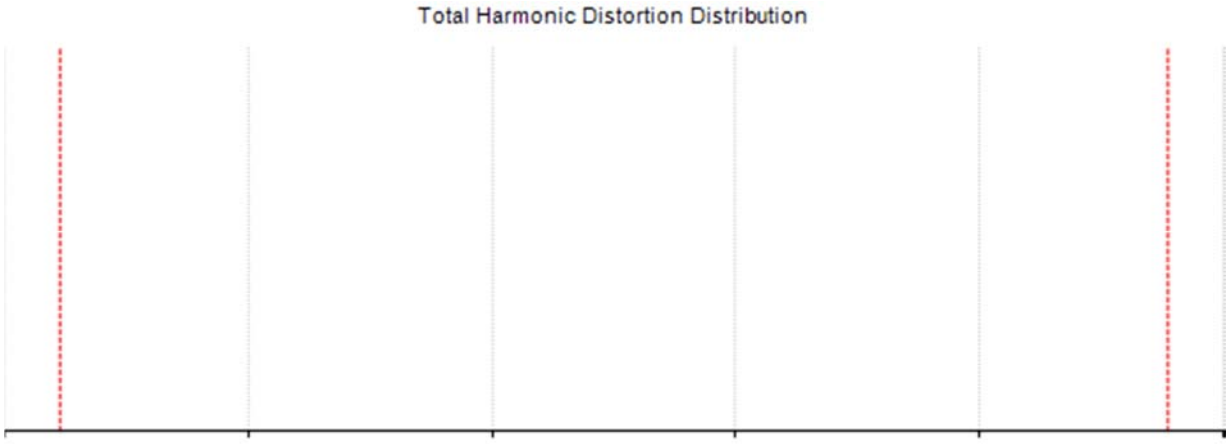
EN50160 Section 4.2.5: Voltage THD

Parameter definition: 10 minute mean RMS value of THD. (Avg)

Limitation: Under normal operating conditions

EN50160 Requirement	**Measured L1 THD**	**Result**
95% of the time: THD ≤ 8%	**1.17%**	**PASS**





No statistics found in PQube data

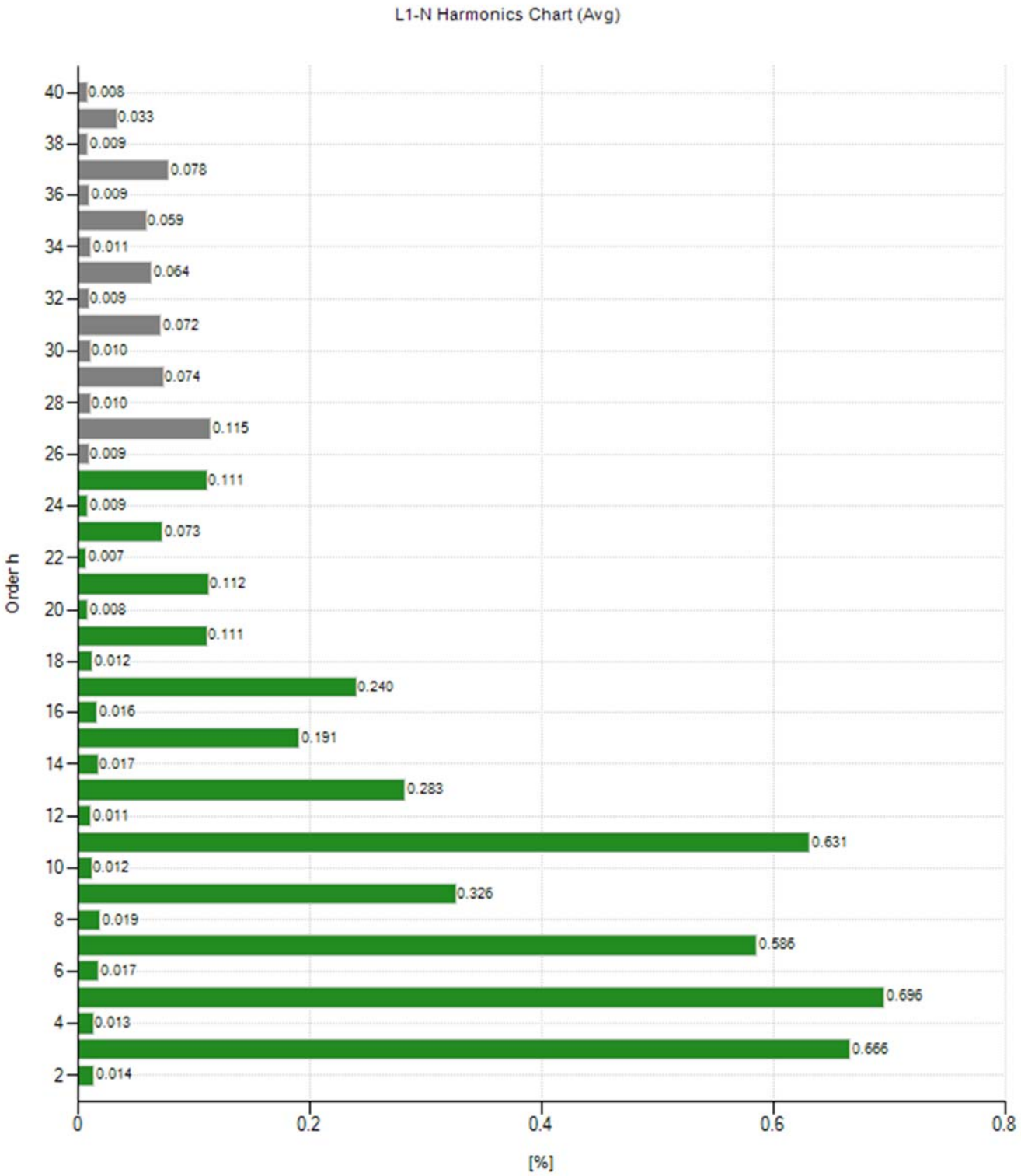
EN50160 Section 4.2.5: Voltage Harmonics

Parameter definition: 10 minute mean RMS values of each individual harmonic voltage.

Limitation: Under normal operating conditions

L1-N Harmonics Table

Odd Harmonics								Even Harmonics			
Not multiples of 3				Multiples of 3							
Order h	*EN50160 limit*	**95% value**	**Result**	*Order h*	*EN50160 limit*	**95% value**	**Result**	*Order h*	*EN50160 limit*	**95% value**	**Result**
H5	*6.0%*	**0.696%**	**PASS**	*H3*	*5.0%*	**0.666%**	**PASS**	*H2*	*2.0%*	**0.014%**	**PASS**
H7	*5.0%*	**0.586%**	**PASS**	*H9*	*1.5%*	**0.326%**	**PASS**	*H4*	*1.0%*	**0.013%**	**PASS**
H11	*3.5%*	**0.631%**	**PASS**	*H15*	*0.5%*	**0.191%**	**PASS**	*H6*	*0.5%*	**0.017%**	**PASS**
H13	*3.0%*	**0.283%**	**PASS**	*H21*	*0.5%*	**0.112%**	**PASS**	*H8*	*0.5%*	**0.019%**	**PASS**
H17	*2.0%*	**0.240%**	**PASS**	*H27*	*None*	**0.115%**		*H10*	*0.5%*	**0.012%**	**PASS**
H19	*1.5%*	**0.111%**	**PASS**	*H33*	*None*	**0.064%**		*H12*	*0.5%*	**0.011%**	**PASS**
H23	*1.5%*	**0.073%**	**PASS**	*H39*	*None*	**0.033%**		*H14*	*0.5%*	**0.017%**	**PASS**
H25	*1.5%*	**0.111%**	**PASS**					*H16*	*0.5%*	**0.016%**	**PASS**
H29	*None*	**0.074%**						*H18*	*0.5%*	**0.012%**	**PASS**
H31	*None*	**0.072%**						*H20*	*0.5%*	**0.008%**	**PASS**
H35	*None*	**0.059%**						*H22*	*0.5%*	**0.007%**	**PASS**
H37	*None*	**0.078%**						*H24*	*0.5%*	**0.009%**	**PASS**
								H26	*None*	**0.009%**	
								H28	*None*	**0.010%**	
								H30	*None*	**0.010%**	
								H32	*None*	**0.009%**	
								H34	*None*	**0.011%**	
								H36	*None*	**0.009%**	
								H38	*None*	**0.009%**	
								H40	*None*	**0.008%**	


L1-N Harmonics Chart (Avg)
Order h
[%]
40
38
36
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0.008
0.033
0.009
0.078
0.009
0.059
0.011
0.064
0.009
0.072
0.010
0.074
0.010
0.115
0.009
0.111
0.009
0.073
0.007
0.112
0.008
0.111
0.012
0.240
0.016
0.191
0.017
0.283
0.011
0.631
0.012
0.326
0.019
0.586
0.017
0.696
0.013
0.666
0.014
0
0.2
0.4
0.6
0.8

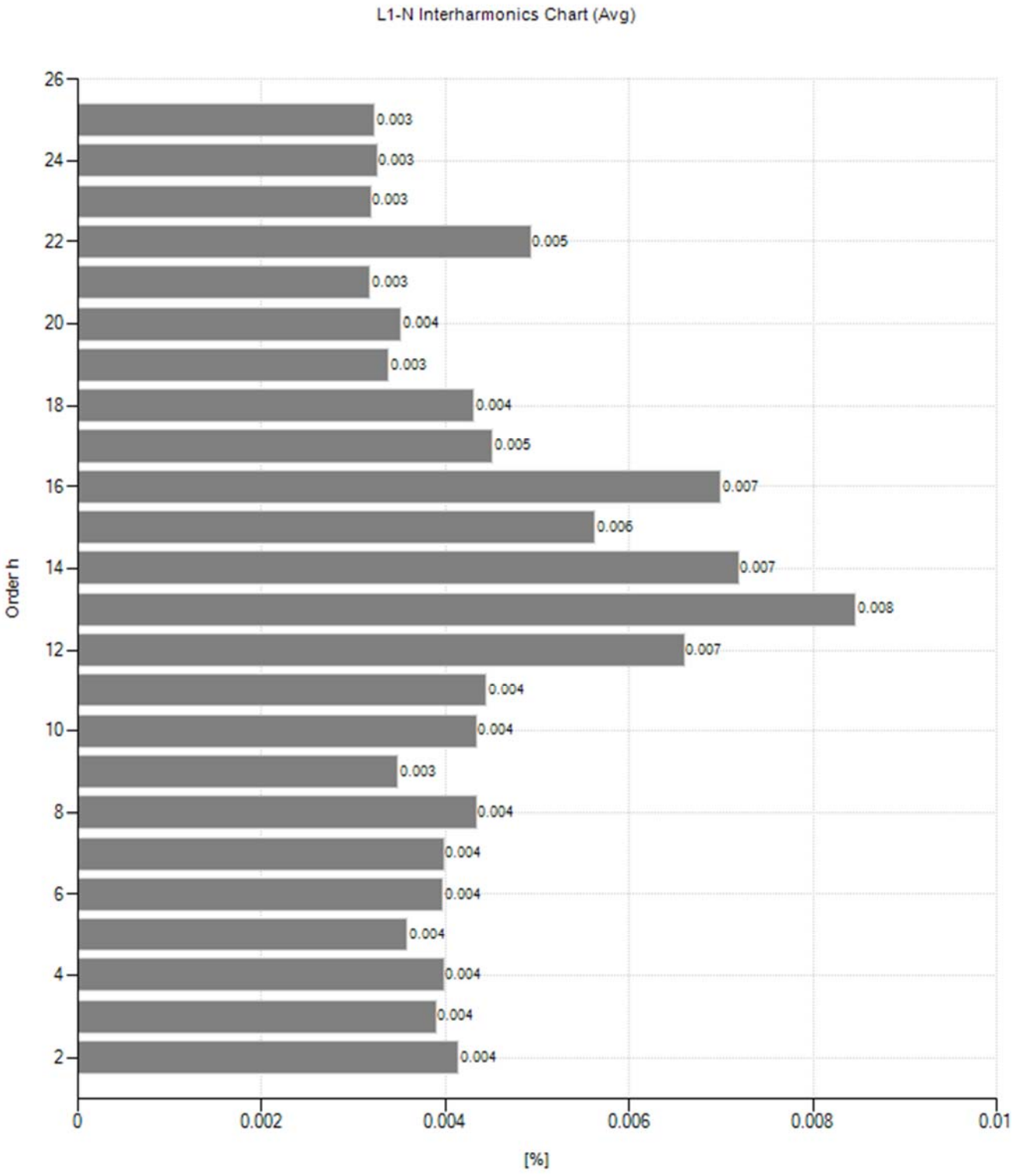
EN50160 Section 4.2.6: Voltage Interharmonics

Parameter definition: The level of interharmonics is increasing due to the development of frequency converters and similar control equipment.

Limitation: Levels are under consideration in EN50160, but there are no limits at present.

L1-N Interharmonics Table

Odd Interharmonics								Even Interharmonics			
Not multiples of 3				Multiples of 3							
Order h	**Min value**	**Average value**	**Max value**	*Order h*	**Min value**	**Average value**	**Max value**	*Order h*	**Min value**	**Average value**	**Max value**
IH5	**0.004%**	**0.006%**	**0.022%**	*IH3*	**0.004%**	**0.008%**	**0.047%**	*IH2*	**0.004%**	**0.008%**	**0.021%**
IH7	**0.004%**	**0.006%**	**0.014%**	*IH9*	**0.003%**	**0.006%**	**0.019%**	*IH4*	**0.004%**	**0.007%**	**0.039%**
IH11	**0.004%**	**0.008%**	**0.024%**	*IH15*	**0.006%**	**0.014%**	**0.036%**	*IH6*	**0.004%**	**0.006%**	**0.016%**
IH13	**0.008%**	**0.015%**	**0.036%**	*IH21*	**0.003%**	**0.007%**	**0.017%**	*IH8*	**0.004%**	**0.006%**	**0.015%**
IH17	**0.005%**	**0.017%**	**0.046%**					*IH10*	**0.004%**	**0.007%**	**0.021%**
IH19	**0.003%**	**0.013%**	**0.040%**					*IH12*	**0.007%**	**0.012%**	**0.030%**
IH23	**0.003%**	**0.008%**	**0.021%**					*IH14*	**0.007%**	**0.014%**	**0.034%**
IH25	**0.003%**	**0.007%**	**0.019%**					*IH16*	**0.007%**	**0.017%**	**0.041%**
								IH18	**0.004%**	**0.014%**	**0.037%**
								IH20	**0.004%**	**0.008%**	**0.018%**
								IH22	**0.005%**	**0.009%**	**0.019%**
								IH24	**0.003%**	**0.008%**	**0.021%**


L1-N Interharmonics Chart (Avg)
Order h
[%]
26
24
22
20
18
16
14
12
10
8
6
4
2
0
0.002
0.004
0.006
0.008
0.01
0.003
0.003
0.003
0.005
0.003
0.004
0.003
0.004
0.005
0.007
0.006
0.007
0.008
0.007
0.004
0.004
0.003
0.004
0.004
0.004
0.004
0.004
0.004

EN50160 Section 4.3.1: Interruptions

No interruptions during 1/25/2016 – 1/31/2016

EN50160 Section 4.3.2: Dips

Parameter definition: According to IEC 61000-4-30 Section 5.4.2.1

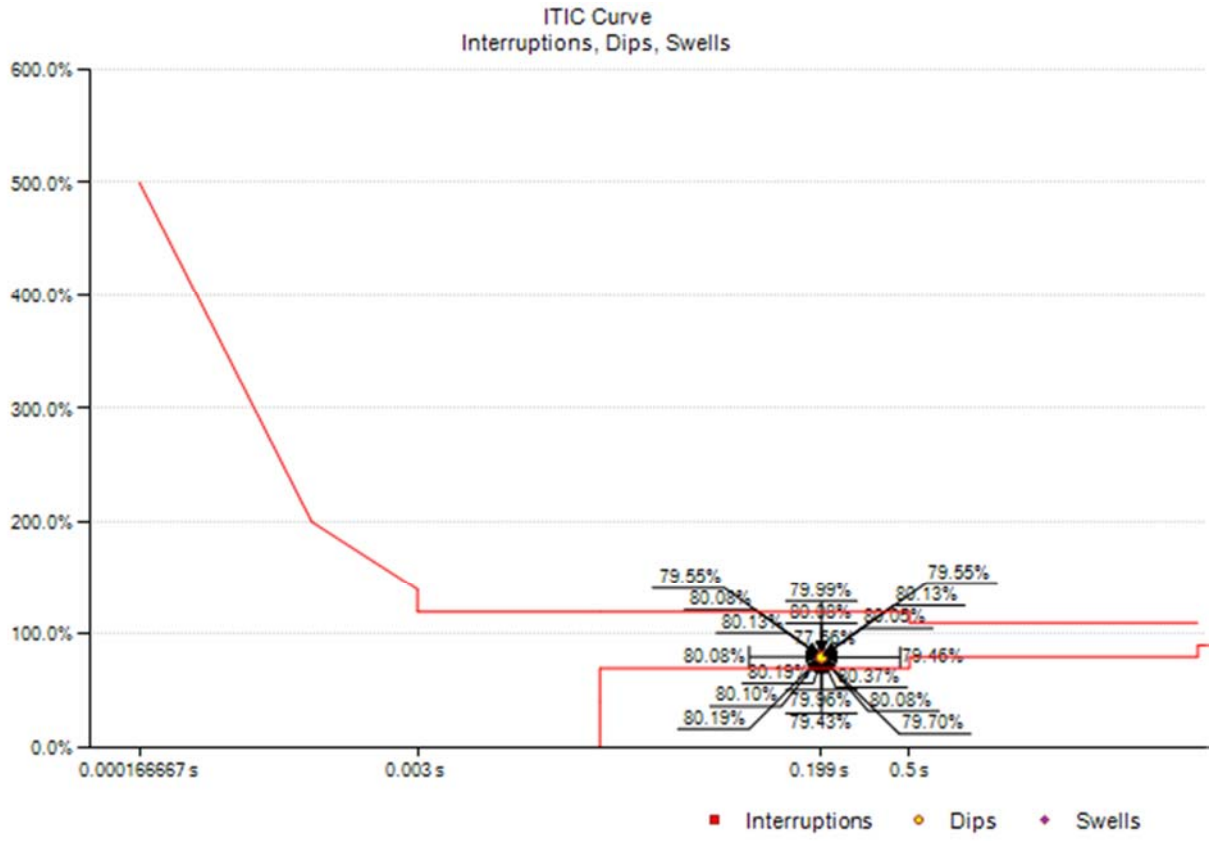
On single-phase systems, a voltage dip begins when the Urms voltage falls below the dip threshold and ends when the Urms voltage is equal to, or above the dip threshold plus the hysteresis voltage. On polyphase systems, a dip begins when the Urms voltage of one or more channels is below the dip threshold and ends when the Urms voltage on all measured channels is equal to, or above the dip threshold plus the hysteresis voltage. The Depth is the difference between the reference voltage and the residual voltage. It generally expressed in percentage of the reference voltage.

Date	Time	Depth	Duration in
2016/01/25	T 11:56:38.023 PST	77.56%	0.209
2016/01/26	T 12:28:33.465 PST	80.19%	0.200
2016/01/26	T 14:06:32.640 PST	80.37%	0.200
2016/01/26	T 14:48:29.555 PST	80.13%	0.200
2016/01/26	T 14:48:34.423 PST	80.05%	0.200
2016/01/26	T 14:48:39.290 PST	80.10%	0.200
2016/01/26	T 14:48:43.858 PST	80.08%	0.200
2016/01/26	T 14:48:48.542 PST	79.96%	0.200
2016/01/26	T 14:48:58.176 PST	80.08%	0.200
2016/01/26	T 14:49:02.976 PST	80.08%	0.200
2016/01/26	T 14:49:07.677 PST	80.08%	0.200
2016/01/26	T 14:49:12.261 PST	80.13%	0.200
2016/01/26	T 14:49:16.995 PST	80.19%	0.200
2016/01/26	T 15:57:29.129 PST	79.99%	0.200
2016/01/28	T 15:55:36.020 PST	79.43%	0.200
2016/01/28	T 15:55:41.120 PST	79.46%	0.200
2016/01/28	T 15:55:46.654 PST	79.70%	0.199
2016/01/28	T 16:48:37.439 PST	79.55%	0.201
2016/01/28	T 16:48:44.592 PST	79.55%	0.200

Limit Voltage u[%]	Duration t[ms]						
	10≤t≤200	200<t≤500	500<t≤1000	1000<t≤5000	5000<t≤60000	t>60000	N/A
90>u≥80	11	-	-	-	-	-	
80>u≥70	6	2	-	-	-	-	
70>u≥40	-	-	-	-	-	-	
40>u≥5	-	-	-	-	-	-	
5>u	-	-	-	-	-	-	
N/A	-	-	-	-	-	-	

EN50160 Section 4.3.3: Swells

No swells during 1/25/2016 – 1/31/2016



EN50160 Section 4.3.4: Transient Overvoltages

Parameter definition: According to IEC 61000-4-30 Clause A.4.4
Impulse on L1-E, L2-E, L3-E exceeds a ±450V peak between 1-µsec and 100-µsec.

Date	Time
2016/01/25	T 15:37:15.504 PST
2016/01/26	T 12:15:33.936 PST
2016/01/26	T 12:15:43.855 PST

EN50160 Section 4.3.5: Waveshape Changes

Parameter definition: Changes in the shape of the waveform of the incoming voltage.

Date	Time
2016/01/25	T 10:04:17.019 PST
2016/01/25	T 12:24:02.212 PST
2016/01/25	T 14:07:20.461 PST
2016/01/25	T 15:16:13.495 PST
2016/01/25	T 15:37:24.067 PST
2016/01/25	T 17:28:29.019 PST
2016/01/26	T 10:48:56.954 PST
2016/01/26	T 11:55:33.645 PST
2016/01/26	T 12:28:33.457 PST
2016/01/26	T 14:06:32.632 PST
2016/01/26	T 14:48:29.547 PST
2016/01/26	T 14:48:34.414 PST
2016/01/26	T 14:48:39.282 PST
2016/01/26	T 14:48:43.850 PST
2016/01/26	T 14:48:48.534 PST
2016/01/26	T 14:48:58.168 PST
2016/01/26	T 14:49:02.968 PST
2016/01/26	T 14:49:07.669 PST
2016/01/26	T 14:49:12.253 PST
2016/01/26	T 14:49:16.986 PST
2016/01/26	T 15:57:29.121 PST
2016/01/26	T 15:58:08.763 PST
2016/01/27	T 08:59:24.658 PST
2016/01/27	T 09:53:53.403 PST
2016/01/27	T 12:04:23.269 PST
2016/01/27	T 13:30:57.249 PST
2016/01/27	T 15:16:06.571 PST
2016/01/27	T 16:09:19.968 PST
2016/01/28	T 12:12:02.869 PST
2016/01/28	T 13:34:06.506 PST
2016/01/28	T 14:58:40.133 PST
2016/01/28	T 15:55:36.012 PST
2016/01/28	T 15:55:41.112 PST
2016/01/28	T 15:55:46.645 PST
2016/01/28	T 16:48:37.431 PST
2016/01/28	T 16:48:44.584 PST
2016/01/29	T 09:09:28.569 PST
2016/01/29	T 11:30:11.875 PST
2016/01/29	T 12:23:18.830 PST
2016/01/29	T 13:15:15.924 PST
2016/01/29	T 14:14:24.466 PST
2016/01/29	T 15:58:35.882 PST

EN50160 Section 4.3.6: Rapid Voltage Changes

Parameter definition: According to IEC 61000-4-30 Clause A.5

The voltage during a rapid voltage change shall not exceed the voltage dip and/or the voltage swell threshold, as it would otherwise be considered as a voltage dip or swell. The characteristic parameter of the rapid voltage change is the difference between the steady state value reached after the change and the initial steady-state value.

Date	Time	Depth	Duration in
2016/01/29	T 19:27:20.503 PST	3.74%	0.033

Conclusions
EN50160 Report
1/25/2016 – 1/31/2016

EN50160 Pass-Fail Requirements Table

EN50160 Sect	Power Quality Parameter	EN50160 Compliance	Remarks
4.2.1	Power Frequency	PASS	Coverage 99.69%
4.2.2	Supply Voltage Variations	PASS	Coverage 99.69%
4.2.3	Flicker Severity	PASS	Coverage 92.16%
4.2.4	Voltage Unbalance	N/A	Unbalance does not apply for this power configuration
4.2.5	Voltage THD	PASS	
4.2.5	Voltage Harmonics	PASS	

EN50160 Additional Information Table

EN50160 Section	Power Quality Parameter	Remarks
4.2.6	Voltage Interharmonics	
4.2.7	Mains Signaling	Not measured
4.3.1	Interruptions	
4.3.2	Dips	
4.3.3	Swells	
4.3.4	Transient Overvoltages	
4.3.5	Waveshape Changes	

Note 1: During 1/25/2016 – 1/31/2016 measurements were made 99.69% of the time
Note 2: Low Voltage Systems (< 1 kV) limits were used.
Note 3: Flagged data was excluded from this report.

Instrument used:	PQube3® (www.PQube3.com)
Manufacturer:	Power Sensors Ltd, U.S.A.
PQube ID:	Mechanical shock testbed
Location:	Intratech SEMICONDUCTORS
Serial number:	P3001523
Firmware revision:	daily_01_27_2016_1927
Calibration Certificate:	http://www.PowerStandards.com/CalibCerts/P3001523.pdf
Report Software:	PQube Report Writer 3.4.0.10
Author of Report:	Power Sensors Ltd
Name:	George Smith

Customer Information

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