# PQube<sup>®</sup> Report Writer 3.0 User's Guide



# **PSL**

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# What is the PQube<sup>®</sup> 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-yourcustomer Microsoft Word® reports. The reports compare the requirements of international standards such as EN50160<sup>1</sup> 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<sup>®</sup> 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<sup>®</sup> 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!

🔍 PQube Report V	Writer	
Language	English	
PSI Author of Repor	t	PQube Report Writer         Revision 3.4.0.10       www.PQube.com         (Requires Microsoft® Word® 2007 or later)       www.PQube3.com
Add compan	ny logo 🛛 🛧 🔛	Create Report
Company: Name: Address 1: Address 2: Address 3: Phone number: Fax number: Website: Customer Inform Company: Name: Address 1: Address 1: Address 1: Address 2: Address 3: Website: Don't forget to SAVE so you can use your customer's information	Power Sensors Ltd George Smith 980 Atlantic Ave Alameda, California USA 94501 ++1-510-522-4400 ++1-510-522-4455 www.PowerSensorsItd.com Alameda California 94501 USA I23 Sample Drive Alameda, California 94501 USA www.Sample.com photos Save Customer Information	1. EN50160 LV Synchronous Connection [Recommended]       View Thresholds         2. Locate PQube data

<sup>1</sup>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<sup>®</sup> 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<sup>®</sup> 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<sup>®</sup> 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<sup>®</sup> Report Writer.

# Installing the Report Writer program

# **System Requirements**

To install the PQube<sup>®</sup> Report Writer program, you will need:

- Microsoft<sup>®</sup> 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<sup>®</sup> Report Writer Setup screen. Click on "Next" to continue.

🛃 PQube Report Writer Se	etup
	Welcome Welcome to the installer for PQube Report Writer 3.4.0.10.
e e	It is strongly recommended that you exit all Windows programs before continuing with this installation.
	If you have any other programs running, please click Cancel, close the programs, and run this setup again.
	Otherwise, click Next to continue.
PSL	
	< Back Next > Cancel

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

Pouse Report Whiter Setup
Shortcut Folder Where would you like the shortcuts to be installed?
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
<ul> <li>Install shortcuts for current user only</li> <li>Make shortcuts available to all users</li> </ul>
< <u>B</u> ack <u>N</u> ext > <u>C</u> ancel
PQube Report Writer Setup
Ready to Install You are now ready to install PQube Report Writer 3.4.0.10
The installer now has enough information to install PQube Report Writer on your computer.
The installer now has enough information to install PQube Report Writer on your computer. The following settings will be used:
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
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
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.



· PQube Report V	Writer	
Language	English	
Language PSIL Author of Repor Add compan Company: Name: Address 1: Address 2: Address 3: Phone number: Fax number: Website: Customer Inform Company: Name:	English t t t t t t t t t t t t t t t t t t t	PQube Report Writer         Revision 3.4.0.10       www.PQube.com         (Requires Microsoft® Word® 2007 or later)       www.PQube3.com         Create Report       View         1. EN50160 LV Synchronous Connection [Recommended]       View         Thresholds       2. Locate PQube data
Address 1: Address 2: Address 3:	Alameda, California 94501 USA	
Website:	www.Sample.com	
Add customer	photos	
	Save Customer Information	
		.::

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<sup>®</sup> Report Writer Program actually writes your report in Microsoft<sup>®</sup> Word<sup>®</sup>. 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: <u>http://www.powersensorsltd.com/PQube#config</u>

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 <a href="http://PQube.com/writer">http://PQube.com/writer</a>.

# **Enter information about your company**

Enter information about your company in the main Report Writer window. The PQube<sup>®</sup> Report Writer uses this information to prepare a Microsoft<sup>®</sup> Word<sup>®</sup> report that is correctly formatted with your company as the preparer of the report. The PQube<sup>®</sup> 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<sup>®</sup> Report Writer will automatically resize it to fit.

# Your company's contact information

Fill in your company's contact information. The PQube<sup>®</sup> 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<sup>®</sup> 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<sup>®</sup> 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<sup>®</sup> 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<sup>®</sup> 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<sup>®</sup> 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 <u>support@PowerSensorsLtd.com</u> - 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<sup>®</sup> Word<sup>®</sup> 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<sup>®</sup> Report Writer is running. Also DO NOT open any other Word document. This may interrupt the program and generate an error.

PQube Report	Writer		
Language	English		Choose an
DQI		PQube Report Writer	or create your
LQL		Revision 3.4.0.10 www.PQube.com	own! You can
Author of Repo	rt	(Requires Microsoft® Word® 2007 or later) www.PQube3.com	report by clicking
Add compar	ny logo 🛛 🛧 🔛	Create Report	on the Edit
Company:	Power Sensors Ltd	1. EN50160 LV Synchronous Connection [Recommended]	Thresholds
Name:	George Smith	2. Locate PQube data SD card, USB or download via FTP	you can only View
Address 1:	980 Atlantic Ave	3. O Daily O Weekly O Monthly O Date Bange	Thresholds for
Address 2:	Alameda, California USA 94501		EN50160 reports
Address 3:		1/31/2016 VI 2016-CW04 VI From 1/25/2016	Choose Daily,
Phone number:	++1-510-522-4400	to 1/31/2016 💌	Weekly,
Fax number:	++1-510-522-4455		Monthly or
Website:	www.PowerSensorsItd.com	Home         Date Range         Trends coverage         Harmonics coverage	vour report.
Customer Inform	nation	1/25/2016 - 1/31/2016 99.7% 99.0%	,
Company:	Sample Customer 💌	Site Information	
Name:	George Sample	PQube ID: Mechanical shock testbed	
Address 1:	123 Sample Drive	Location: Intratech SEMICONDUCTORS Click	Prepare to calculate
Address 2:	Alameda, California 94501 USA	Power Configuration: Single Phase L1-N you	Trends and Harmonics
Address 3:		Nominal Voltage: 120.00 V COVE	rage for your report.
Website:	www.Sample.com	PQube serial number: P3001523	
er obsider		Firmware revision: daily_01_27_2016_1927	
Add custome	r photos	5. Create Report	
	Save Customer Information	Click Create Benort to start writing the report in MS Word	
C:\Users\jma\Desk	ctop\PQube Report Writer 3.4.0.10\P	Qube Report Writer amples/Sample PQube data/PSL/2016	

PQube Report Writer	
Do not click on Microso	ft® Word® document while generating report
	Continue

# 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.

🕷 PQube Report V	Writer	
Language	English	
PSL Author of Repor	t	PQube Report Writer Revision 3.4.0.10 (Requires Microsoft® Word® 2007 or later) (Requires Microsoft® Word® 2007 or later)
Add compar	ny logo 🛛 🛧 🚋	Create Report
Company: Name: Address 1: Address 2: Address 3: Phone number: Fax number: Website: Customer Inform Company: Name: Address 1: Address 1: Address 2: Address 3: Website: Add customer	Power Sensors Ltd George Smith 980 Atlantic Ave Alameda, California USA 94501 ++1-510-522-4400 ++1-510-522-4455 www.PowerSensorsltd.com Mation Sample Customer George Sample 123 Sample Drive Alameda, California 94501 USA www.Sample.com photos Save Customer Informatio	n

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 predefined per EN50160 standards and cannot be edited.

Thresholds - EN50160 LV S	ynchronous Connection [Rec	ommended]				
General Frequency Volta	age RMS   Current   Flicker   Ur	nbalance   Voltage Han	monics	Voltage Int	terharmonics	Cun 🔸 🕨
Short name:	EN50160		Exclude	flagged da	ta	
Coverage:	80 ÷					
Description of Standard:	Characteristics of Voltage at a I	Network User's Supply	Terminals	: Limits and	l Values	
Note 1:	Low Voltage Systems (< 1 kV) I	imits were used.				
Note 2:	Flagged data was excluded from	m this report.				
Note 3:						
Note 4:						
	'	Lies Three helds	Min	A	Maria	
Fragueneu			Min	Avg	Max	
Voltage RMS	<u>⊻</u>	 		 		
Current						
Flicker	- 	- -		, 	1	
Unhalance	· ·	<u> </u>		, 		
Voltage THD	<u></u>	V		N.	Γ	
Voltage Harmonics		V	,		,	
Voltage Interhamonics	V	Γ				
Current TDD	Γ		Г		Г	
Current Harmonics	Γ		,	-	-	
Current Interharmonics						
Mains Signaling						
Power					Γ	
Power Factor						
Energy						
Interruptions, Dips, Swells						
Transient Overvoltages						
Waveshape Changes						
Rapid Voltage Changes	$\overline{\mathbf{V}}$					
			ancel			
			ancer			

Thresholds - EN50160	LV Synchronous Connection [Recommended]
General Frequency	Voltage RMS   Current   Flicker   Unbalance   Voltage Harmonics   Voltage Interharmonics   Cu
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 - EN5016	0 LV Synchronous Connection [Recommended]
General Frequency	Voltage RMS Current   Flicker   Unbalance   Voltage Harmonics   Voltage Interharmonics   Cu
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 v minutes

Thresholds - EN50160 LV Synchronous Connection [Recommended]								
Voltage RMS   Current Flicker Unbalance   Voltage Harmonics   Voltage Interharmonics   Current Harmonics   Curre								
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   Curre								
	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 v minutes								

Thresholds - EN50160 LV Synchronous Connection [Recommended]									
Voltage RMS Current   Fli	cker Unbalance Voltage Harmonics	Voltage	Interha	monics	Curre	ent Han	monics	Curre	• •
THD Section Title: 4.2.5	Voltage THD	9	9 <mark>5</mark> % lim	it					
Parameter definition:	10 minute mean RMS value of THD.	Order h	% limit	Order h	% limit	Order h	% limit	Order h	% limit
		2	2.0	18	0.5	34	$\square$	50	
		3	5.0	19	1.5	35		51	
		4	1.0	20	0.5	36		52	
		5	6.0	21	0.5	37		53	
		6	0.5	22	0.5	38		54	
Limitation:	Under normal operating conditions	7	5.0	23	1.5	39		55	
95 % limit	%THD: 8 %	8	0.5	24	0.5	40		56	
Interval	10 💌 minutes	9	1.5	25	1.5	41		57	
		10	0.5	26		42		58	
		11	3.5	27		43		59	
Voltage Harmonics	Voltage Hamonics	12	0.5	28		44		60	
Parameter definition:	10 minute mean RMS values of each	13	3.0	29		45		61	
r arameter definition.	individual harmonic voltage.	14	0.5	30		46		62	
		15	0.5	31		47		63	
		16	0.5	32		48			
		17	2.0	33		49			
Limitation :	Under normal operating conditions								
Max order:	40 🚊								

Thresholds - EN50160 LV Synchronous Connection [Recommended]									
General   Frequency   Voltage RMS   Current   Flicker   Unbalance   Voltage Harmonics Voltage Interharmonics Cu									
Section Title: 4.2.6	Voltage Interharmonics	95	5 % limi	t					
Parameter definition:	The level of interharmonics is increasing due to the development of frequency converters and similar control equipment.	Order h	% limit	Order h	% limit	Order h	% limit	Order h	% limit
		2		18	$\square$	34		50	
		3		19	$\square$	35		51	
		4		20	$\square$	36		52	
		5		21		37		53	
limitation:	Levels are under consideration in EN5(	6		22		38		54	
Max and an		7		23		39		55	
Max order:	20 -	8		24		40		56	

# Choose a non-EN50160 standard

If you are not interested in an EN50160 compliance report, the PQube<sup>®</sup> Report Writer program comes preloaded 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.

Language	English	
Add company I Add company I Company: A Name: A Address 1: A Address 3: A Phone number: A Fax number: A Website: A	logo × Power Sensors Ltd George Smith 980 Atlantic Ave Alameda, California USA 94501 ++1-510-522-4400 ++1-510-522-4455 www.PowerSensorshtd.com	PQube Report Writer         Revision 3.4.0.10       www.PQube.com         (Requires Microsoft® Word® 2007 or later)       www.PQube3.com         (Requires Microsoft® Word® 2007 or later)       www.PQube3.com         Create Report         1.       Harmonics       Image: Colspan="2">Image: Colspan="2">View         EN50160 LV Synchronous Connection [Recommended]       Image: Colspan="2">View         Image: Colspan=2       View         Image: Colspan=2       View         State Colspan=2         State Colspan=2         View         Thresholds         View         Thresholds         Image: Colspan=2         View         Thresholds         ENS0160 MV Synchronous Connection (Island)         ENS0160 MV Non-Synchronous Connection (Island)       ENS0160 HV Non-Synchronous Conne

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

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@ PQube Report V	Writer	×
Language	English	
PSI. Author of Repor	t	PQube Report Writer       Revision 3.4.0.10       (Requires Microsoft® Word® 2007 or later)       www.PQube.com
Add compan Company:	Power Sensors Ltd	Create Report  I. Harmonics  Edit Thresholds
Name: Address 1:	George Smith 980 Atlantic Ave	2. Locate PQube data
Address 2: Address 3:	Alameda, California USA 94501	
Phone number: Fax number:	++1-510-522-4400 ++1-510-522-4455	
Website:	www.PowerSensorshtd.com	

The first screen that appears are your "General" settings for **Harmonics**. You can edit your coverage (in %), choose whether to exclude/include flagged data<sup>2</sup> 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.

Thresholds - Harmonics									
General Frequency Volta	General Frequency   Voltage RMS   Current   Flicker   Unbalance   Voltage Harmonics   Voltage Interharmonics   Cu								
Short name:	Hamonics	<b>V</b>	Exclude fla	agged da	ta				
Coverage:	80 🕂								
Description of Standard:	Characteristics of Voltage at a Ne	naracteristics of Voltage at a Network User's Supply Terminals: Limits and Values							
Note 1:	Low Voltage Systems (< 1 kV) lim	ow Voltage Systems (< 1 kV) limits were used.							
Note 2:	Flagged data was excluded from	lagged data was excluded from this report.							
Note 3:									
Note 4:									
	Include in Report	Use Thresholds	Min	Ava	Max				
Frequency				•					
Voltage RMS	<b>v</b>			<b>v</b>					
Current									
Flicker									
Unbalance									
Voltage THD	$\checkmark$			$\checkmark$					
Voltage Harmonics	$\checkmark$								
Voltage Interharmonics	$\checkmark$								
Current TDD	$\checkmark$			$\checkmark$					
Current Harmonics	$\checkmark$								
Current Interharmonics	$\checkmark$								
Mains Signaling									
Power									
Power Factor									
Energy									
Interruptions, Dips, Swells									
Transient Overvoltages									
Waveshape Changes									
Rapid Voltage Changes									
		Ca	ancel			Save			

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

Thresholds - Harmonics											
General Frequency Volt	General Frequency Voltage RMS Current Flicker Unbalance				e Voltage Harmonics Voltage Interharmonics Cu						
Section Title: 3 Parameter definition:	Voltage THD 10 minute mean RMS value of THD.	Order h 2 3	% limit 2.0	Order h 18	% limit	Order h 34 35	% limit	Order h 50	% limit		
		4	1.0 6.0	20 21	0.5	36 37		52 53			
Limitation:	Under normal operating conditions	6 7 8	0.5 5.0 0.5	22 23 24	0.5	38 39 40		54 55 56			
Interval	10 v minutes	9	1.5	25 26 27	1.5	41 42 43		57 58			
Voltage Harmonics	Voltage Harmonics	12	0.5	29 28 29		44 45		60			
Parameter definition:	10 minute mean RMS values of the each individual voltage harmonic shall be less than or equal to the values given in below table.	14	0.5	30 31		46		62 63			
		10	2.0	32		48					
Limitation:       Under normal operating conditions         Max order:       40         The default harmonic order is 40. Click on the arrow keys to increase or decrease your harmonic order. Maximum is 60.											
			Car	ncel				Save			

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.

PQube Configurator 2.1.7.17							
File Help	IMPORTANT: Filename must be saved as Setup.ini		Firmware version 2.1.7				
Global Default Settings	PQube General Info AC Voltage AC Current Auxiliary Inputs Relay Outputs	Carbon General	Events & Snapshots Voltage Triggering				
EN50160 Settings	Current Triggering Auxiliary Triggering Temperature Triggering Trend	Logging Harmonic	Communications Email & Filter				
🖭 👕 PQube General Info 📤	Default Harmonics Settings						
AC Voltage	Spectrum Harmonics in Snapshots Enable Snapshot Harmonics						
🗈 👘 AC Current	Trand Individual Harmonice						
Auxiliary Inputs	Trend Harmonic Interval In Minutes: 15 V						
Relay Outputs	New! Voltage Harmonics: Volts_and_THD	▼ 🚱					
🗄 📦 Carbon	New! Current Harmonics: Amps_and_TDD	• •					
General Events & Sn;							
🖅 📦 Voltage Triggering							
🖅 📦 Current Triggering							

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

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

PQube 3 Configurator 3.4.3.0		
<u>F</u> ile <u>H</u> elp		
Global Default Settings EN50160 Settings POube general info C voltage C voltage triggering C C current	Restore Defaults Power configuration Power configuration: AUTO Nominal phase to phase voltage: AUTO Nominal phase to neutral voltage: AUTO Nominal frequency: AUTO	Voltage recordings Record phase to phase channels: AUTO V Record phase to neutral channels: AUTO V
AC additional currents     Current triggering     Downstream voltage     Analog inputs     Analog triggering     Analog triggering     Accelerometer     Accelerometer     Relay outputs     Events	Voltage connections Potential transformer ratio: 1:1 ? Fix connections errors L1 Input connected to: L1   ? L2 Input connected to: L2 L3 Input connected to: L3 N Input connected to: N	Record Flicker Flicker lamp voltage: 120  Flicker lamp voltage: Record voltage THD Record voltage unbalance Record 10 second frequency Record IEC 61000-4-30 10 min interval Record IEC 61000-4-30 10 min interval Record 2-150kHz conducted emissions Unbalance calculation method: EC
Trend logging     Armonics     Mains signaling     Meins kignaling		

# **Energy standard**

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

ſ	PQube Report V	Vriter	
	Language	English	
	Author of Report	t X	PQube Report Writer Revision 3.4.0.10 (Requires Microsoft® Word® 2007 or later) Create Report
	Add company: Name: Address 1: Address 2: Address 3: Phone number: Fax number: Website:	Vilogo X Power Sensors Ltd George Smith 980 Atlantic Ave Alameda, California USA 94501 ++1-510-522-4400 ++1-510-522-4455 www.PowerSensorsItd.com	Lenergy       Edit         EN50160 LV Non-Synchronous Connection (Island)       Image: Connection (Island)         EN50160 MV Synchronous Connection (Island)       Image: Connection (Island)         EN50160 MV Synchronous Connection (Island)       Image: Connection (Island)         EN50160 HV Synchronous Connection (Island)       Image: Connection (Island)         EN50160 HV Non-Synchronous Connection (Island)       Image: Connection (Island)         ENSO160 HV Non-Synchronous Connection (Island)       Image: Connection (Island)         <

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

· PQube Report V	Writer			
Language	English			
Add compan Add compan Company: Name: Address 1: Address 2: Address 3: Phone number: Fax number: Website:	t y logo × Power Sensors Ltd George Smith 980 Atlantic Ave Alameda, California USA 94501 ++1-510-522-4400 ++1-510-522-4455 www.PowerSensorsltd.com	PQube Report Writer Revision 3.4.0.6 (Requires Microsoft® Word® 2007 or later) Create Report 1. ENERGY 2. Locate PQube data	www.PQube.com www.PQube3.com	Edit Thresholds

The first screen that appears are your "General" settings for **Energy**. You can edit your coverage (in %), choose whether to exclude/include flagged data<sup>2</sup> 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.

Thresholds - ENERGY						
General Frequency   Voltage RMS   Current   Flicker   Unbalance   Voltage Harmonics   Voltage Interharmonics   Cu						
Short name:	Energy		Exclude fla	agged da	ta	
Coverage:	80 🕂					
Description of Standard:	Power and Energy Summary					
Note 1:	Flagged data was excluded from	this report.				
Note 2:						
Note 3:						
Note 4:						
	lookuda in Parat	Lies Thresholds	Min	A	Marc	
Frequency				Avg		
Voltage RMS			- -		- -	
Current						
Flicker	<b>v</b>	Γ			Г	
Unbalance	Γ	Γ	Γ	Г	Γ	
Voltage THD	Γ		Γ	Γ	Γ	
Voltage Harmonics						
Voltage Interharmonics						
Current TDD						
Current Harmonics						
Current Interharmonics						
Mains Signaling						
Power			$\checkmark$	✓	$\checkmark$	
Power Factor	$\checkmark$		$\checkmark$	✓	$\checkmark$	
Energy	$\checkmark$	$\Box$				
Interruptions, Dips, Swells						
Transient Overvoltages						
Waveshape Changes						
Rapid Voltage Changes						
		C	ancel			Save

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

Thresholds - ENERGY					
Voltage Interharmonics   Current Harmonics   Current Interharmonics   Mains Signaling Power Energy   Interruptions					
Real Power					
Section Title: 3 Real Power					
Parameter definition: Sample-by-sample instantaneous voltage times instantaneous current					
Interval: 1 v minutes Calculation: Avg value v					
Reactive Power					
Section Title: 4 Reactive Power					
Parameter definition: Also known as imaginary power, this exists when the voltage and current are out of phase.					
Interval: 1 v minutes Calculation: Avg value v					
Apparent Power					
Section Title: 5 Apparent Power					
Parameter definition: RMS voltage times RMS current					
Interval: 1 v minutes Calculation: Avg value v					
Power Factor					
Section Title: 6 Power Factor					
Parameter definition: Real Power divided by Apparent Power					
Limitation: For systems with a synchronous connection to an interconnected system					
Demand interval 15  minutes minutes # minutes inside Interval:					
Power Factor Limits: 0.9					
Cancel					

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!

@ PQube Report	Writer	
Language	English	
Author of Repor Add compar Company: Name: Address 1: Address 2: Address 3: Phone number: Fax number: Website:	t Ty logo X Power Sensors Ltd George Smith 980 Atlantic Ave Alameda, California USA 94501 ++1-510-522-4400 ++1-510-522-4455 www.PowerSensorsItd.com	PQube Report Writer         Revision 3.4.0.10         www.PQube.com         (Requires Microsoft® Word® 2007 or later)         www.PQube.3.com         Create Report         1.       PQube Trend         EN50160 MV Synchronous Connection       Image: Synchronous Connection         EN50160 MV Synchronous Connection (Island)       Ensolido HV Synchronous Connection (Island)         EN50160 HV Non-Synchronous Connection (Island)       Image: Synchronous Connection (Island)         Harmonics       POubs Trend       Image: Synchronous Connection (Island)         Houts Trend       Image: Synchronous Connection (Island)       Image: Synchronous Connection (Island)         Harmonics       Image: Synchronous Connection (Island)       Image: Synchronous Connection (Island)         Houts Trend       Image: Synchronous Connection (Island)       Image: Synchronous Connection (Island)         Harmonics       Image: Synchronous Connection (Island)       Image: Synchronous Connection (Island)       Image: Synchronous Connection (Island)         Harmonics       Image: Synchronous Connection (Island)       Image: Synchronous Connection (Island)       Image: Synchronous Connection (Island)         Harmonics       Image: Synchronous Connection (Island)       Image: Synchronous Connection (Island)       Image: Synchronous Connection (Island

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

🐨 PQube Report \	Writer	
Language	English	
Add compar Add compar Company: Name: Address 1: Address 2: Address 3: Phone number: Fax number: Website:	t Power Sensors Ltd George Smith 980 Atlantic Ave Alameda, California USA 94501 ++1-510-522-4400 ++1-510-522-4455 www.PowerSensorsItd.com	PQube Report Writer         Revision 3.4.0.10       www.PQube.com         (Requires Microsoft® Word® 2007 or later)       www.PQube3.com         Create Report       Edit         1.       PQube Trend         2.       Locate PQube data

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<sup>2</sup> 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.

Thresholds - PQube Trend						
General Frequency   Voltage RMS   Current   Flicker   Unbalance   Voltage Harmonics   Voltage Interharmonics   Cu						
Short name:	PQube Trend 🔽 Exclude flagged data					
Coverage:	80 🕂					
Description of Standard:	Standard PQube Trend Report					
Note 1:	No limits were used in this report.	No limits were used in this report.				
Note 2:	Flagged data was excluded from t	this report.				
Note 3:						
Note 4:						
	Include in Penart	Liee Threeholds	Min	Ava	Max	
Frequency						
Voltage BMS	, ·				<u>.</u>	
Current		Γ				
Flicker		Π				
Unbalance			~	•	1	
Voltage THD				<b>V</b>	~	
Voltage Harmonics	$\checkmark$					
Voltage Interharmonics						
Current TDD	$\overline{\mathbf{v}}$		<b>v</b>	$\checkmark$	~	
Current Harmonics	$\overline{\mathbf{v}}$					
Current Interharmonics						
Mains Signaling						
Power	$\checkmark$		~	✓	~	
Power Factor	<b>v</b>		<ul><li>✓</li></ul>	◄	<ul><li>✓</li></ul>	
Energy	$\checkmark$					
Interruptions, Dips, Swells	$\checkmark$					
Transient Overvoltages						
Waveshape Changes						
Rapid Voltage Changes						
		G	ancel	1		Save
				1		

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

Thresholds - POube Trend				
Mains Signaling   Power   Energy   Interruptions Dips   Swells   Transients   Waveshape Changes   Rapid Voltage				
Section Title: 18 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.				
<ul> <li>Voltage Sag Waveform</li> <li>Voltage Sag RMS</li> <li>By default, your report will include both a waveform and RMS graph. If there are more than one voltage dip/sag, it will choose the event with the largest dip/sag. To exclude the graphs in your report, uncheck the boxes.</li> </ul>				
Cancel				

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"

PSL		PQube Report Writer Revision 3.4.0.10 www.PQube.com
Author of Repor	ny logo	(Requires Microsoft® Word® 2007 or later) <u>www.PQube3.com</u>
Company: lame: .ddress 1: .ddress 2: .ddress 3: hone number: ïax number:	Power Sensors Ltd George Smith 980 Atlantic Ave Alameda, California USA 94501 ++1-510-522-4400 ++1-510-522-4455	1. NEW       Thresholds         2. Locate PQube data       Standard Name         Standard       Standard:         Solar Panel Installation       Finter a name for your standard
Vebsite: C <b>ustomer Infom</b> Company: Iame:	www.PowerSensorsltd.com nation Sample Customer George Sample	Create a brand new report Create a report from an existing one OK Cancel
Address 1: Address 2: Address 3:	123 Sample Drive Alameda, California 94501 USA	
Add customer	photos	

[	PQube Report V	Vriter		
	Language	English		
	Dei		PQube Report Writer	
	LOL		Revision 3.4.0.10 www.PQube.com	
	Author of Repor	t —	(Requires Microsoft® Word® 2007 or later) <u>www.PQube3.com</u>	
	Add compan	y logo 🛛 🛧 🖳	Create Report	
	Company:	Power Sensors Ltd	1. Solar Panel Installation	Edit Thresholds
	Name:	George Smith	2. Locate PQube data	
	Address 1:	980 Atlantic Ave		

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 <u>and</u> select "Min", "Avg" and/or "Max".

Thresholds - Solar Panel Installation						
General Frequency   Voltage RMS   Current   Flicker   Unbalance   Voltage Harmonics   Voltage Interharmonics   Cu						
Short name:	Solar Panel Installation	Solar Panel Installation				
Coverage:	50 ÷					
Description of Standard:	Measuring the energy efficiency of	of (5) newly installed re	oftop pane	els		
Note 1:	Santa Monica Hills					
Note 2:						
Note 3:						
Note 4:						
	lealuda in Depart	Lies Threeholds	Min	A	Marc	
Frequency				,⊼vg		
Voltage RMS	, ,		- -		- -	
Current						
Flicker	Γ	Γ		Γ		
Unbalance	Γ					
Voltage THD						
Voltage Harmonics						
Voltage Interharmonics						
Current TDD						
Current Harmonics						
Current Interharmonics						
Mains Signaling						
Power	$\checkmark$		$\checkmark$	$\checkmark$	<b>v</b>	
Power Factor	$\checkmark$	<b>v</b>	~	$\checkmark$	~	
Energy	$\checkmark$					
Interruptions, Dips, Swells						
Transient Overvoltages						
Waveshape Changes						
Rapid Voltage Changes						
		C	ancel	1		Save
				1		

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.

Thresholds - Solar Panel Installation					
General Frequency Voltage RMS Current Flicker Unbalance Voltage Harmonics Voltage Interharmonics Cu					
Section Title: 1 Frequency					
Parameter definition:	Parameter definition: Mean value of fundamantal frequency				
Limitation:	Frequency limits to +/- 1% tolerance				
99 % limits:	For example, at 60Hz, your frequency must be within +/- 1% for 99% and 100%				
100 % limits:	of the measurement period.				

Thresholds - Solar Panel Installation					
General   Frequency Voltage RMS   Current   Flicker   Unbalance   Voltage Harmonics   Voltage Interharmonics   Cu					
Section Title:	2 Voltage				
Parameter definition:	10 minute mean RMS value of the supply voltage				
Limitation:					
95 % limits:	- 5 % to + 5 %				
100 % limits:	- 7 % to + 7 %				
Interval 1 5 1	Select the interval in minutes of your measurement readings for your graphs For more resolution, select "1". The default interval is 10.				



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

Sample Report from the PQube<sup>®</sup> 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 <u>http://www.Sample.com</u>

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**

EN5 0160 Sect	Power Quality Parameter	EN50160 Complianc e	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:

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: Manufacturer: PQube ID: Location: Serial number: Firmware revision: Calibration Certificate: Report Software: Author of Report: Name: PQube3® (www.PQube3.com) Power Sensors Ltd, U.S.A. Mechanical shock testbed Intratech SEMICONDUCTORS P3001523 daily\_01\_27\_2016\_1927

#### http://www.PowerStandards.com/CalibCerts/P3001523.pdf

PQube Report Writer 3.4.0.10 Power Sensors Ltd 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

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#### www.PQube3.com

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



Photo 1 - photo1



Photo 2 - photo2

http://www.PowerSensorsltd.com

#### www.PQube3.com

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

# 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



Frequency Distribution

 1		

No statistics found in PQube data

### EN50160 Section 4.2.2: Supply Voltage Variations

### Nominal Voltage :

Limitation:

120.00V L-N

Parameter definition:

10 minute mean RMS value of the supply voltage

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:

Limitation:

Long term flicker severity Plt (2 hour intervals) (Max) Under normal operating conditions

EN50160 Requirement	Measured L1 Plt	Result
95% of the time: $Plt \leq 1$	0.40	PASS



### EN50160 Section 4.2.4: Voltage Unbalance

Parameter definition:

Limitation:

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

Unbalance does not apply for this power configuration

### EN50160 Section 4.2.5: Voltage THD

Parameter definition:

Limitation:

10 minute mean RMS value of THD. (Avg) Under normal operating conditions

EN50160 Requirement	Measured L1 THD	Result
95% of the time: THD $\leq$ 8%	1.17%	PASS





No statistics found in PQube data

# EN50160 Section 4.2.5: Voltage Harmonics

Parameter definition:

Limitation:

10 minute mean RMS values of each individual harmonic voltage.

Under normal operating conditions

L1-N Harmonics Table	L1-N	Harmonics	Table
----------------------	------	-----------	-------

Odd Harmonics											
	Not n	nultiples of 3		Multiples of 3					Ever	n Harmonics	
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)

# 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	Interharmo	nics Table
------	------------	------------

	Odd Interharmonics										
Not multiples of 3				Multiples of 3				Even Interharmonics			
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%





### 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< th=""><th>500<t≤1000< th=""><th>1000<t≤5000< th=""><th>5000<t≤60000< th=""><th>t&gt;60000</th><th>N/A</th></t≤60000<></th></t≤5000<></th></t≤1000<></th></t≤500<>	500 <t≤1000< th=""><th>1000<t≤5000< th=""><th>5000<t≤60000< th=""><th>t&gt;60000</th><th>N/A</th></t≤60000<></th></t≤5000<></th></t≤1000<>	1000 <t≤5000< th=""><th>5000<t≤60000< th=""><th>t&gt;60000</th><th>N/A</th></t≤60000<></th></t≤5000<>	5000 <t≤60000< th=""><th>t&gt;60000</th><th>N/A</th></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

### <u>Conclusions</u> EN50160 Report 1/25/2016 – 1/31/2016

### EN50160 Pass-Fail Requirements Table

EN5 0160 Sect	Power Quality Parameter	EN50160 Complianc e	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	
435	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: Manufacturer: PQube ID: Location: Serial number: Firmware revision: Calibration Certificate: Report Software: Author of Report: Name:

**Customer Information** 

PQube3® (www.PQube3.com) Power Sensors Ltd, U.S.A. Mechanical shock testbed Intratech SEMICONDUCTORS P3001523 daily\_01\_27\_2016\_1927

http://www.PowerStandards.com/CalibCerts/P3001523.pdf

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