APPLICATION NOTE

EN50160 Report

What is an EN50160 test?

The EN50160 test is a European standard that specifies the main characteristics of the voltage at a network user's supply terminal. The standard applies to public low voltage, medium voltage and high voltage AC electricity networks under normal operating conditions. In the UK, the test is known as a BS50160 test.

This standard does not apply under abnormal operating conditions, including but not limited to temporary arrangements to keep users supplied during fault, maintenance and/or construction work.

The MPQ series tests the public low voltage networks and operates according to the BS EN50160:2010+A1:2015. The requirements can be adjusted using the data analysis template in the PC software. The EN50160 report uses the specifications in the data analysis template.

How to perform an EN50160 test?

1. Enable the EN50160 test from the front panel of the MPQ analyzer. It is a standard test supplied on the analyzer.

2. Connect the analyzer to the point of common coupling (PCC) on the network.

   NOTE: This test is designed for a 4 wire 3 wattmeter wye configuration.
   Best Practices: Verify the instrument is connected correctly. Verify the KW is positive. Verify the vectors are correct. The current vectors should not exceed 90 degrees of the voltage vectors.

3. Start the recording by pressing the record button.
   The MPQ instrument will provide a message if the current clamps are set improperly or the unit is not connected properly, providing you are using self-identifying current clamps.

4. Allow the instrument to record for one week.

5. Transfer the data to the PC using either the SD Card or a USB stick. Additionally, transfer it using a USB cable or over an Ethernet network.

6. In the Megger PQ PC software select the data file by highlighting the desired data file in the data file bar.

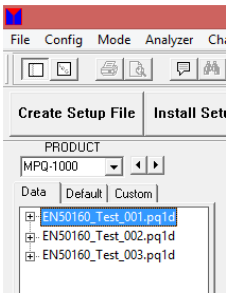
7. Enter customer information by clicking on FILE / EDIT. This data will be saved to the highlighted data file.

8. To create the EN50160 report open the Megger PQ PC software and perform the steps below.

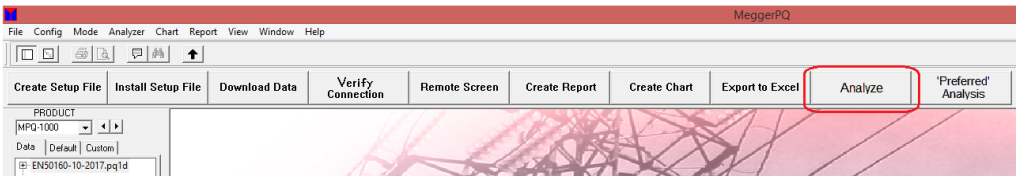
Megger USA - Valley Forge Corporate Centre
2621 Van Buren Avenue, Norristown, Pennsylvania, 19403, USA
T. 1-610 676 8500 F. 1-610-676-8610

EN50160 Report

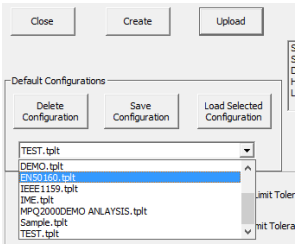
Highlight the desired data file in the data file bar.



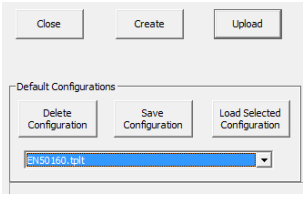
Select ANALYZE



Select the EN50160 template



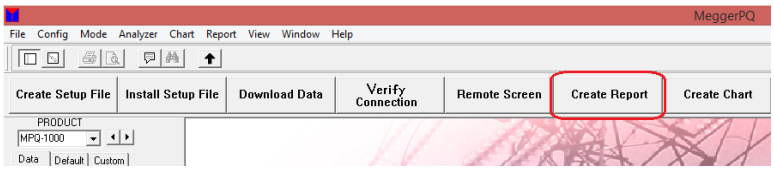
Click on the LOAD SELECTED CONFIGURATION button



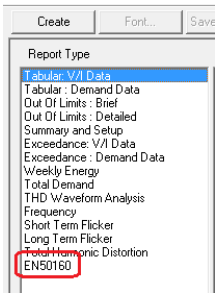
APPLICATION NOTE

EN50160 Report

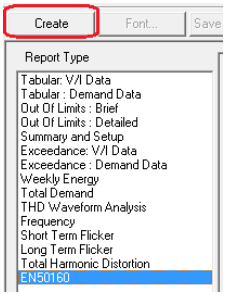
Exit the Data Analysis section
Select CREATE REPORT



Select EN50160



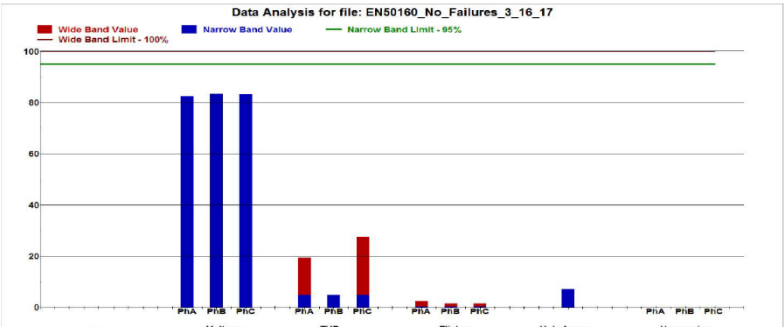
Click CREATE



The EN50160 report will now be generated. The report will indicate which parameters passed and which failed. The report will also provide the details of each parameter as shown below.
Print or save as PDF.

EN50160 Report

Data Analysis Results		
Frequency	FAIL	Data file does not contain Average Frequency data.
RMSVoltage	FAIL	
THD	PASS	
Flicker	PASS	
Unbalance	FAIL	
Events	PASS	
Harmonics	PASS	
Test Compliance	FAIL	

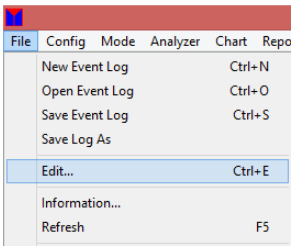


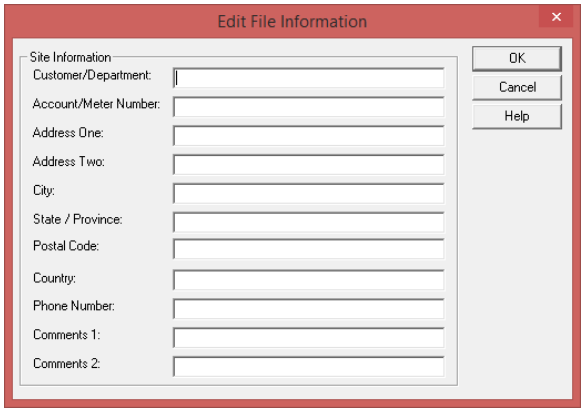
EN50160 report sections
Customer information

Customer Information			
Customer/Department:	Megger Test	City:	Norristown
Account/Meter Number:	VF0001	State / Province:	PA
Address 1:	2621 Van Buren Ave	Postal Code:	19403
Address 2:		Country:	United States
Phone Number:	6106768500	Comment 1:	Comment Line 1

The customer information section of the report provides the end customer information. This can include customer name, account number, address, state or province, country, zip code as well as comments.

To enter or edit this data, highlight the desired data file in data file bar, click on FILE then EDIT. The “Edit File Information” screen will open. Customer information can now be entered and saved to the data file.





EN50160 Report

System information

System Information			
File Name:	EN50160_No_Failures_3_16_17	Test Start:	06/08/2017 at 01:12:03 PM
Model and Version:	MPQ-1000 1.248	Length of Test:	20.24 Hours
Serial Number:	X0014	Default Frequency:	50
Analyzer Tag:	EN50160	Voltage:	228.68 Volts
		Power measurement:	4-Wire Wye 3-Wattmeter

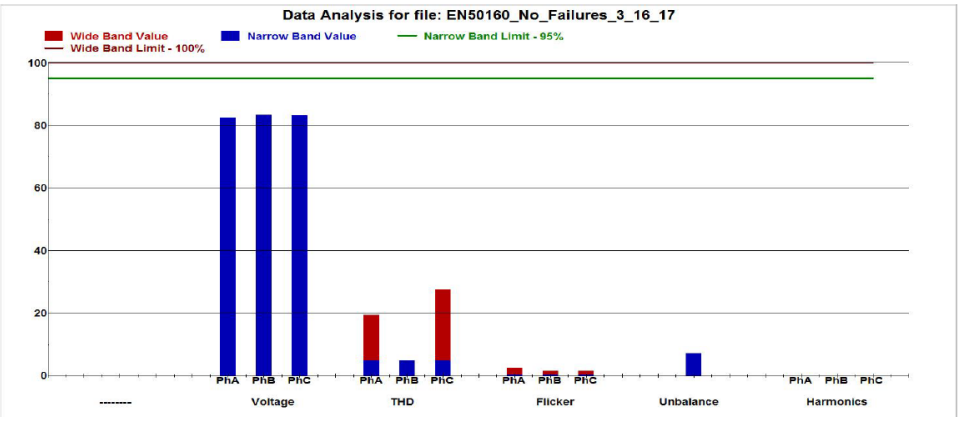
The system information section of the report provides the setup file name used during the recording, the type of analyzer used as well as the serial number of the analyzer. This section also indicates the start date of the test as well as the duration, the power configuration used as well as overall voltage and frequency.

Data analysis results

Data Analysis Results		
Frequency	FAIL	Data file does not contain Average Frequency data.
RMSVoltage	FAIL	
THD	PASS	
Flicker	PASS	
Unbalance	FAIL	
Events	PASS	
Harmonics	PASS	
Test Compliance	FAIL	

The data analysis results section of the report displays which tests passed the required EN50160 standards and which tests failed.

Note: If the term "Quality" appears next to events, this indicates that the event programming did not meet the requirements of the EN50160 standard.



The chart in the data analysis results section shows graphically which trended data passed and which failed. The green line indicates the narrow band limit and the blue bar represents the narrow band

data. If the blue bar exceeds the green line this is a failure. The red line indicates the wide band limit and the red bar indicates the wide band data. If the red bar exceeds the red line, this indicates a failure.

Frequency data

Frequency Data	
99.5% Neg Deviation:	1.00
99.5% Pos Deviation:	1.00
100% Neg Deviation:	2.00
100% Pos Deviation:	2.00
99.5% Limit Result:	FAIL
Interval Compliance:	0.00
100% Limit Result:	FAIL
Interval Compliance:	0.00

The frequency deviation section displays the following data.
99.5% Neg deviation: displays the negative limit for the frequency that must be met for 99.5% of the time. This value is in Hertz. The frequency cannot deviate below nominal by more than 1Hz for 99.5% of the record time.
99.5% Pos deviation: displays the positive limit for the frequency that must be met for 99.5% of the time. This value is in Hertz. The frequency cannot deviate above nominal by more than 1Hz for 99.5% of the record time.
100% Neg deviation: displays the negative limit for the frequency that must be met for 100% of the time. This value is in Hertz. The frequency cannot deviate below nominal by more than 2Hz for 100% of the record time.
100% Pos deviation: displays the positive limit for the frequency that must be met for 100% of the time. This value is in Hertz. The frequency cannot deviate above nominal by more than 2Hz for 100% of the record time.
99.5% limit results: displays the results of the 99.5% or narrow band frequency test.
Interval compliance: displays the percentage of intervals is within the 99.5% or narrow band limit.
100% limit results: displays the results of the 100% or wide band frequency test.
Interval compliance: displays the percentage of intervals is within the 100% or wide band limit.

Voltage variation 95% / week

Voltage Variation 95% / week				
Nominal Voltage::	228.68			
Narrow Limit:	95.00			
95% Limit Deviation:	-10.00/10.00			
95% Result:	FAIL			
		Va	Vb	Vc
95% Limit Result:		FAIL	FAIL	FAIL
Interval Compliance:		0.00	0.00	0.00

The voltage variation 95% / week section displays the following data.
Nominal voltage: displays the declared nominal voltage.
Narrow limit: displays the percentage of time that the measured values must be within the specified limits. In this case, the narrow band is 95% of the time.

95% limit deviation: displays the positive and negative limit for the voltage that must be met during the narrow limit. (95% of the time)
95% limit results: displays the results of the 95% or narrow band voltage test for all 3 phases.
Interval compliance: displays the percentage of intervals for each phase is within the narrow band limit.

Voltage Variation 100% / week

Voltage Variation 100% / week			
Nominal Voltage::	228.68		
Wide Limit:	100.00		
100% Limit Deviation:	-15.00/15.00		
100% Result:	FAIL		
	Va	Vb	Vc
100% Limit Result:	FAIL	FAIL	FAIL
Interval Compliance:	0.00	0.00	0.00

The voltage variation 100% / week section displays the following data.
Nominal voltage: displays the declared nominal voltage.
Wide limit: displays the percentage of time that the measured values must be within the specified limits. In this case, the wide band is 100% of the time.
100% limit deviation: displays the positive and negative limit for the voltage that must be met during the wide limit. (100% of the time)
100% limit results: displays the results of the 100% or wide band voltage test for all 3 phases.
Interval Compliance: displays the percentage of intervals for each phase is within the wide band limit.

Unbalance data

Unbalance Data	
95% Limit Deviation:	2.00
95% Result:	FAIL
Interval Compliance:	91.23
100% Limit Deviation:	3.00
100% Result:	FAIL
Interval Compliance:	86.67

The unbalance data section displays the following data.
95% Limit Deviation: Displays maximum limit for the voltage unbalance that must be met during 95% of the test time. (In this case 2%)
95% Results: Displays the results of the 95% or narrow band unbalance test.
Interval Compliance: Displays the s of intervals is within the 95% narrow band limit.
100% Limit Deviation: Displays maximum limit for the voltage unbalance that must be met during 100% of the test time (in this case 3%).
100% Results: Displays the results of the 100% or wide band unbalance test.
Interval Compliance: Displays the percentage of intervals is within the 100% wide band limit.

Flicker data

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Flicker Data			
Plt 95% Deviation:	1.00		
	Va	Vb	Vc
Plt 95% Limit Result:	PASS	PASS	PASS
Interval Compliance:	100.00	100.00	100.00

The flicker data section displays the following data.
Plt 95% Limit Deviation: Displays maximum limit for the long term flicker that must be met during 95% of the test time. (In this case, the max value is 1.00.)
Plt 95% Limit Results: Displays the results of the 95% or narrow band flicker test for all three phases.
Interval Compliance: Displays the percentage of intervals is within the 95% narrow band limit for all three phases.

Voltage dips

Voltage Dips						
Nominal Voltage::	228.68					
Limit Deviation:	90%					
Events:	<200ms	>200ms	>500ms	>1s	5-60s	>60s
80 < Vx < 90 %	0	0	0	0	0	0
70 < Vx < 80 %	0	0	0	0	0	0
40 < Vx < 70 %	0	0	0	0	0	0
5 < Vx < 40 %	0	0	0	0	0	0

The voltage dips are categorized based on magnitude and duration in the above table per the standard. There is no pass fail criteria for the dips. The level and duration of dips needs to be assessed on a case by case basis.

Voltage swells

Voltage Swells				
Nominal Voltage::	228.68			
Limit Deviation:	110%			
Events:	<500ms	>500ms	5-60s	>60s
110 < Vx < 120 %	0	0	0	0
Vx > 120 %	0	0	0	0

The voltage swells are categorized based on magnitude and duration in the above table per the standard. There is no pass fail criteria for the swells. The level and duration of swells needs to be assessed on a case by case basis.

Voltage interruptions

EN50160 Report

Voltage Interruptions		
Amplitude Event Limit	< 5 %	
Short Event Duration	< 180s	
Long Event Duration	>= 180s	
	Short	Long
Events:	0	0
Minimum Value:	100.0	100.0
Maximum Duration:	0.0	0.0

The voltage interruptions section displays the following data.
Amplitude event limit: displays the limit that triggers a voltage interruption. In this case, the voltage must be less than 5% of nominal.
Short event duration: displays the duration of short-term interruptions. In this case, they must be less than 180 seconds.
Long event duration: displays the duration of long-term interruptions. In this case they must be equal to or greater than 180 seconds.
Events: displays the number of short and long-term interruptions that occurred during the test.
Minimum value: displays the minimum voltage value recorded during an interrupt. This value is displayed as a percentage of the nominal voltage.
Maximum duration: displays the duration of the longest interruption, in seconds.

Rapid voltage change

Rapid Voltage Changes	
Amplitude Event Limit	> 5 %
Allowed Events:	20 / week
Events:	0
Compliance:	PASS
Maximum Duration:	0.0

The rapid voltage change section displays the following data.
Amplitude event limit: displays limit that triggers a rapid voltage change. (In this case, the amplitude must change by more than 5%.)
Allowed events: displays the maximum number of events allowed in one week (In this case 20).
Events: display the number of rapid voltage change events that occurred during the test interval.
Compliance: displays if the recording passed or failed the RVC test.
Maximum duration: displays the duration of the longest RVC event, in seconds.

Mains signalling

Mains Signaling			
Event Amplitude Limit	9% for freq < 500"	7% for freq = 700	5% for freq > 1000
Event Compliance Limit	99% of each day		
Max Events per day	0		
Compliance	PASS		

The Mains signalling limit section displays the following data.

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Amplitude event limit: displays the limits that trigger main signalling events. (In this case 9% of the fundamental for frequencies under 500Hz, 5% for frequencies above 1000Hz and for frequencies between 500 and 1000Hz there is a slope that averages at 7% at 700Hz.)
Event compliance limit: displays the percentage of time each day that the mains signalling must be within its limits. (In this case 99% of the time the mains signalling must be within its limits.)
Max events per day: displays the maximum number of events in one day during the test interval.
Compliance: displays if the recording passed or failed the mains signalling test.

THD Data

THD Data

95% Limit Deviation: 8.00
100% Limit Deviation: 10.00

	Va	Vb	Vc
95% Result:	PASS	PASS	PASS
Interval Compliance:	100.00	100.00	100.00
100% Result:	PASS	PASS	PASS
Interval Compliance:	100.00	100.00	100.00

The THD data section displays the following data.
95% limit deviation: displays maximum limit for the voltage THD that must be met during 95% of the test time (in this case 8%).
100% limit deviation: displays maximum limit for the voltage THD that must be met during 100% of the test time (in this case 10%).
95% result: displays the results of the 95% or narrow band THD test for all 3 phases.
Interval compliance: displays the percentage of intervals is within the 95% narrow band limit for all 3 phases.
100% result: displays the results of the 100% or narrow band THD test for all 3 phases.
Interval compliance: displays the percentage of intervals is within the 100% wide band limit for all 3 phases.

Harmonic Data

Harmonics Data

Low Frequency Deviation: Various

	Va	Vb	Vc
Low Frequency Result:	PASS	PASS	PASS
Interval Compliance:	100.00	100.00	100.00

The harmonic data section displays the following data.
Low frequency deviation: displays maximum limit for the harmonic orders. In this case it varies for different harmonic orders.
Low frequency results: display the results of the harmonic test for all 3 phases.
Interval Compliance: Displays the percentage of intervals that is within the limits for all 3 phases.

Harmonic Table

The harmonic table displays the limits for each order harmonic and the actual measured value for each order harmonic.

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Harmonics Table				
Harmonic	Limit	Va	Vb	Vc
2	5.00	0.00	0.00	0.00
3	5.00	0.01	0.01	0.01
4	5.00	0.00	0.00	0.00
5	5.00	0.00	0.00	0.00
6	5.00	0.00	0.00	0.00
7	5.00	0.00	0.00	0.00
8	5.00	0.00	0.00	0.00
9	5.00	0.00	0.00	0.00
10	5.00	0.00	0.00	0.00
11	5.00	0.00	0.00	0.00
12	5.00	0.00	0.00	0.00
13	5.00	0.00	0.00	0.00
14	5.00	0.00	0.00	0.00
15	5.00	0.00	0.00	0.00
16	5.00	0.00	0.00	0.00
17	5.00	0.00	0.00	0.00
18	5.00	0.00	0.00	0.00
19	5.00	0.00	0.00	0.00
20	5.00	0.00	0.00	0.00
21	5.00	0.00	0.00	0.00
22	5.00	0.00	0.00	0.00
23	5.00	0.00	0.00	0.00
24	5.00	0.00	0.00	0.00
25	5.00	0.00	0.00	0.00
26	5.00	0.00	0.00	0.00
27	5.00	0.00	0.00	0.00
28	5.00	0.01	0.01	0.01
29	5.00	0.01	0.01	0.01
30	5.00	0.03	0.03	0.03
31	5.00	0.01	0.01	0.01
32	5.00	0.01	0.01	0.01
33	5.00	0.01	0.01	0.01
34	5.00	0.01	0.01	0.01
35	5.00	0.01	0.01	0.01
36	5.00	0.02	0.02	0.02
37	5.00	0.02	0.02	0.02
38	5.00	0.02	0.02	0.02
39	5.00	0.02	0.02	0.02
40	5.00	0.02	0.02	0.02
41	5.00	0.02	0.02	0.02
42	5.00	0.02	0.02	0.02
43	5.00	0.01	0.01	0.01
44	5.00	0.01	0.01	0.01
45	5.00	0.01	0.01	0.01
46	5.00	0.01	0.01	0.01
47	5.00	0.01	0.01	0.01
48	5.00	0.01	0.01	0.01
49	5.00	0.00	0.00	0.00

Harmonics negative sequences negative, zero and positive

The negative sequence, zero sequence and positive sequence charts display the harmonic data graphically. These charts display which orders passed and which failed. The green line indicates the limit and the blue bar represents the harmonic magnitude. If the blue bar exceeds the green line this is a failure.

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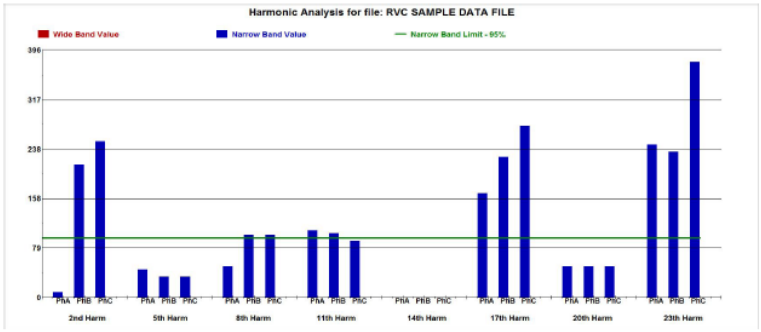

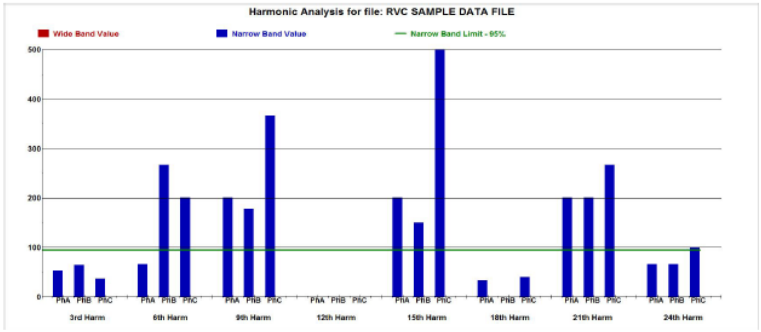

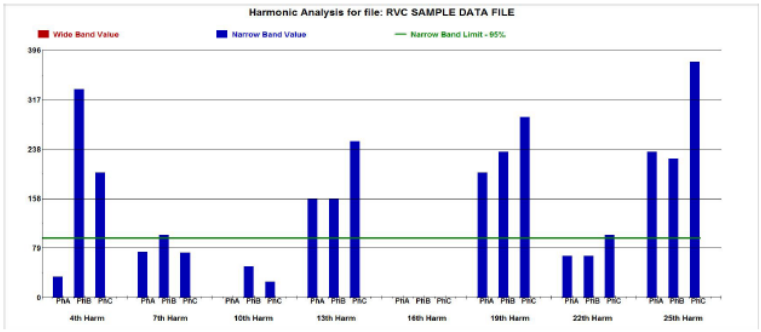

Acronyms

Acronyms	
Va	= Phase A Voltage
Ia	= Phase A Current
Vb	= Phase B Voltage
Ib	= Phase B Current
Vc	= Phase C Voltage
Ic	= Phase C Current
Vn	= Neutral Voltage
In	= Neutral Current
Ig	= Earth Current
CT	= Current Transformer (Current Clamp)
RVC	= Rapid Voltage Change
THD	= Total Harmonic Distortion
TDD	= Total Demand Distortion

The acronyms section of the report provides the definition of the various acronyms used in the report.