

Dranetz HDPQ Plus & SP Products and IEEE 519-2014

INTRODUCTION

IEEE Std. 519-2014, IEEE Recommended Practice and Requirements for Harmonic Control in Electric Power Systems is the most current recommended practice from the IEEE related to harmonics measurement and compliance. Although the recommended practices from the IEEE are usually only followed in North America, IEEE 519-2014 is also being applied in Latin America, Asia, India and other parts of the world. As a result, there is a lot of interest in IEEE 519-2014 and how to use it.

IEEE 519-2014 includes the harmonic measurement techniques of the widely used IEC 61000-4-7. IEEE 519-2014 adds two additional parameters, along with new requirements for statistics reporting for harmonic compliance. Therefore, instruments that only measure to IEC 61000-4-7 are missing required capabilities.

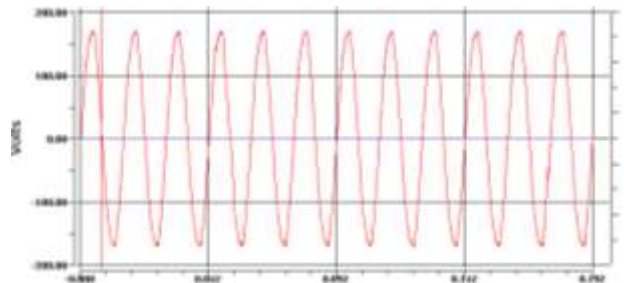
The Dranetz HDPQ Plus and SP family are among the few instruments that fully comply with the measurement and reporting requirements of IEEE 519-2014. This application note focuses on the requirements of IEEE 519-2014 and how they apply to the Dranetz HDPQ Plus and SP products.

HARMONIC MEASUREMENT STANDARDS

The original IEEE 519-1992 recommended practice included descriptive information about harmonics and harmonic compliance limits. However, instrument data acquisition methods were not defined. The result was different manufacturers used different harmonic measurement techniques that produced different and inconsistent results.

IEEE 519-2014 addresses this by referencing the harmonic measurement techniques of IEC 61000-4-7. IEC 61000-4-7, and the broader IEC 61000-4-30 power quality measurement standard are well established, and have been adopted around the world. IEEE 519-2014 states "...any instrument used should comply with the specifications of IEC 61000-4-7 and IEC 61000-4-30." Dranetz is a global supplier of power quality monitoring products and has complied with both of these standards since their inception in the early 2000's.

IEC 61000-4-7 defines a harmonic measurement window width of 200ms, which is 12 cycles at 60Hz and 10 cycles at 50Hz. Each (DFT, Discrete Fourier Transform) harmonic analysis uses this 200ms window of data for its computations and this window is the smallest resolution for harmonic measurements in the Dranetz HDPQ Plus & SP. Harmonic analysis is based on the evaluation of continuous 200ms windows without gaps.



NEW PARAMETERS FOR IEEE 519-2014

For statistical analysis, IEEE 519-2014 adds two parameters to the measurement methods of IEC 61000-4-7: *Very Short Time Harmonics* and *Short Time Harmonics*. It is important to note that these two new parameters are unique to IEEE 519-2014 and are not part of IEC 61000-4-7. This means that an instrument measuring to IEC 61000-4-7 does not necessarily comply with IEEE 519-2014.

Very short time harmonics are assessed over a 3-second interval and include 15 consecutive 200ms (12/10 cycle) windows. Without going into the specific details, harmonic components are aggregated over this interval and are then used for statistical evaluation.

Short time harmonics are assessed over a 10-minute interval and are an aggregation of 200 consecutive very short time values. Short time harmonics are aggregated over the required (10 minute) interval and then used for statistical evaluation.

IEEE 519-2014 HARMONIC STATISTICAL EVALUATION

IEEE 519-2014 states that very short time harmonics should be accumulated over a one-day period and the 99th percentile values should be calculated for each individual harmonic to the 50th each day. Short time

harmonics should be accumulated over a one-week period, and the 95th and 99th percentile values should be calculated for each individual harmonic to the 50th each week.

IEEE 519-2014 also includes recommended harmonic limits measured at the PCC (Point of Common Coupling). The intent is to manage the harmonics at the interface point between utility system owners and end users, so the specified limits apply only at the PCC and not for individual loads.

For voltage harmonics, the recommended limits for individual harmonics and VTHD are specified at various bus voltages measured at the PCC. Acceptable limits are based upon the bus voltage, with higher bus voltages having lower acceptable limits (they are farther away from the harmonic generating loads).

Similarly, recommended limits for individual current harmonics are specified at several different bus voltage levels at the PCC, but TDD (Total Demand Distortion) is referenced and not ITHD. This means that TDD must also be computed by the instrument which is not part of IEC 61000-4-7. Current harmonics measured at higher bus voltage levels have lower acceptable limits (they are farther away from the harmonic generating loads).

The actual compliance limits are outside of the scope of this application note, so see section 5 of IEEE 519-2014 for more details.

DRANETZ HDPQ PLUS & SP IEEE 519-2014 REPORTS

Although Dranetz products have measured harmonics to IEC 61000-4-7 for many years, IEEE 519-2014 adds the two new harmonic measurement parameters and statistical evaluation requirements. The only Dranetz portable product that can fulfill these requirements are the Dranetz HDPQ Plus & SP family.

The Dranetz HDPQ Plus & SP have a built in harmonic statistics report that includes the very short time and short time harmonics. The report produces pass/fail daily and weekly voltage and current harmonic compliance in accordance with IEEE 519-2014.

To view the report, press the *Harmonics Statistics Report* button in the *View Data* page.

You will then see a list of daily and weekly harmonic statistic reports over the last 31 days, with each indicating pass or fail. There will be one very short time 99th percentile report for each day, and two

short time reports for each week (one for the 99th percentile and the other for the 95th percentile).

Harmonics Statistics				
Reports for 31 days prior to and including: Apr 17, 2017				
Date	Interval	Statistic	Compliance	Clicked
Apr 17, 2017	Daily	Very Short (99th)	Pass	
Apr 16, 2017	Daily	Very Short (99th)	Pass	
Apr 15, 2017	Weekly	Short (95th)	Pass	
Apr 15, 2017	Weekly	Short (99th)	Pass	
Apr 15, 2017	Daily	Very Short (99th)	Pass	

Simply select a report in the list and press **OPEN** to view the details of the compliance for each harmonic to the 50th.

Harmonics Statistics Details										
Date	Interval	Statistic: Very Short (99th)								Compliance
Apr 17, 2017	Daily									Pass
Harms.	AV	AE	BF	BI	CV	CE	GV	DE		
2	0.047	2.193								
3	2.570	132.315								
4	0.067	2.037								
5	1.754	103.005								
6	0.030	1.003								
7	0.465	81.575								
8	0.027	2.169								
9	0.633	77.058								
10	0.017	2.205								
11	0.388	83.174								
12	0.013	2.103								
13	0.209	48.989								

Dran-View 7 software also includes IEEE 519-2014 harmonic compliance reporting that uses the statistical data compiled by the HDPQ Plus & SP instruments (only).

SUMMARY

IEEE 519-2014 is a significant update to the original version from 1992. In addition to specifying new harmonic measurement parameters and compliance limits, IEEE 519-2014 includes the harmonic measurement techniques of the globally accepted IEC 61000-4-7 harmonic standard.

The Dranetz HDPQ Plus & SP family are among the few products available that fully conform to both the measurement and compliance reporting requirements of IEEE 519-2014.

TO CONTACT DRANETZ

- Call 1-800-372-6832 (US and Canada) or 1-732-287-3680 for Technical or Sales support
- To submit a support request online, please visit: <https://www.dranetz.com/technical-support-request/>