An Overview of Measurement Standards for Power Distribution Network Harmonics

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Power quality (PQ): validity of parameters related to voltage and current of electric power available to customers

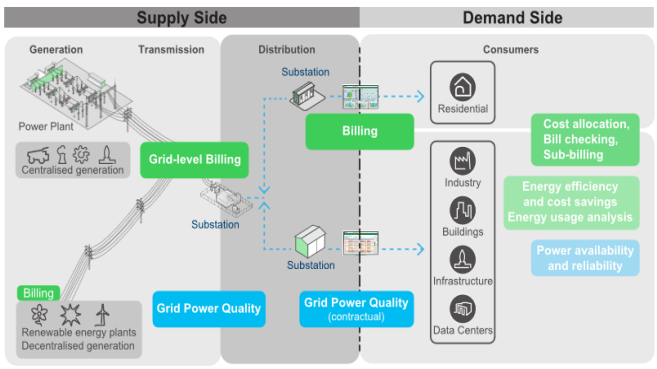


Figure 1. Measurement applications both in supply and demand-side[19]

EN 50160 standard lists the most essential electric supply voltage parameter values and tolerances.

Parameters for Low Voltage Supply (up to 1 kV)

Voltage variations: **±10 and –15%** range of rated voltage, all any 10 min RMS values cannot exceed

Voltage unbalance: **95% of the 10 min mean RMS value**: negative phase sequence component should be in range of 0 to 2% of positive phase sequence comp.

Distortions: **THD ≤ 8%, individual harmonics within 95%** of the 10 min mean RMS value for one week.

New technologies bring more focus to PQ:

Power electronic inverters, for **PV and HES (home energy storage)**

- power harmonics (up to 2 kHz),
- super/supra-harmonics (between 2 to 9 kHz and 9 kHz … 150 kHz).

Here scope will be on the lower frequency area

*IEC 61000-4-30. **Electromagnetic compatibility (EMC) - Part 4-30: Testing and measurement techniques - Power quality measurement methods***

- Testing instrument specifications

US standard IEEE 519-2014

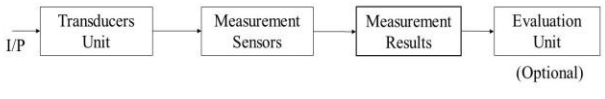
Similar to EN 50160

THD is 8% with a new PCC value for voltage (V ≤ 1.0 kV), and it also defines a new maximum individual value for high-order harmonics

- For **3 secs**, the harmonic currents < 2x current distortion limits of the **daily 99th percentile**.
- For **10 min**, the harmonic currents should be less one and a half time than the current distortion of the **weekly 99th percentile**.
- For **10 min**, the harmonic currents should be less than the current distortion of the **weekly 95th percentile**.

*IEC 61000-4-7. **Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - Section 7: General guide on harmonics and interharmonics measurements and instrumentation, for power supply systems and equipment connected thereto***

- Harmonic calculation methods and measurement processing, reporting



*IEC 61000-4-13 **Electromagnetic compatibility (EMC) - Part 4-13: Testing and measurement techniques - Harmonics and interharmonics including mains signalling at a.c. powerport, low frequency immunity tests***

- To verify the performance of a device: meeting the conditions likely in the distribution grid