

An update on IEC 61000-4-30 : Power Quality Measurement Methods



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IEC 61000-4-30 is the PQ Measurement Method Standard

- All instruments that use Class A methods will, when connected to the same signal, produce the same result.
- Power Standards Lab in USA is the 61000-4-30 Class A Certification Lab for the world.
- I am the Convenor (chairman) of this Standards, for 10 years



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IEC 61000-4-30 is required by almost every electric power company in the world.

- North America, South America
- Asia, Australia
- Europe, South Africa
- Any power company that measures power quality requires Class A.

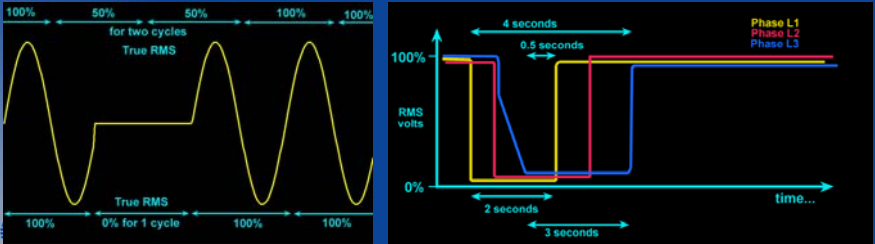


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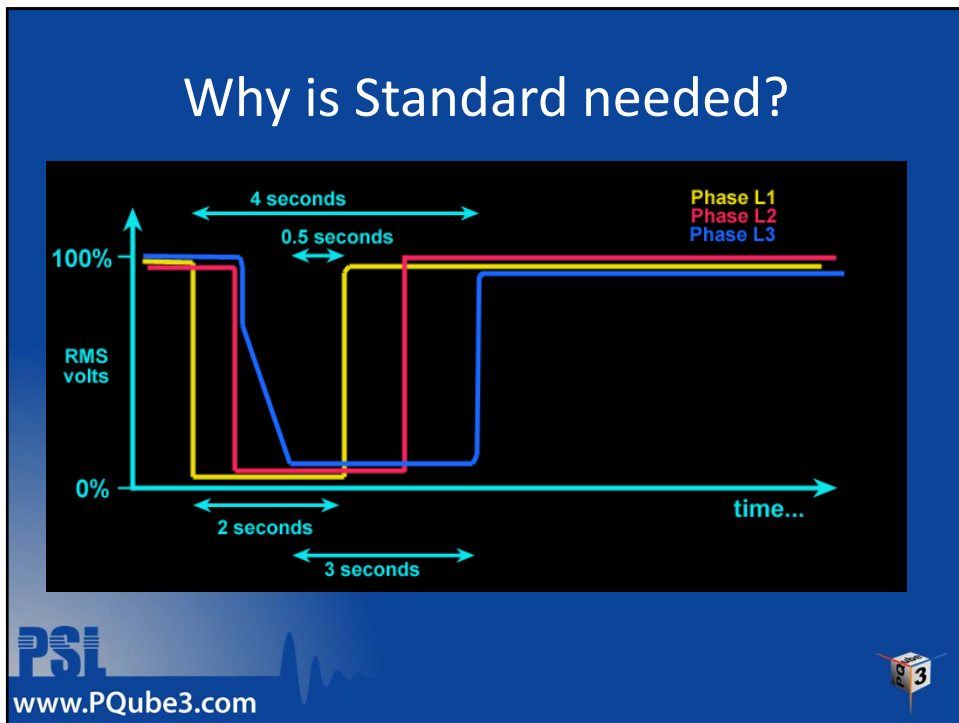
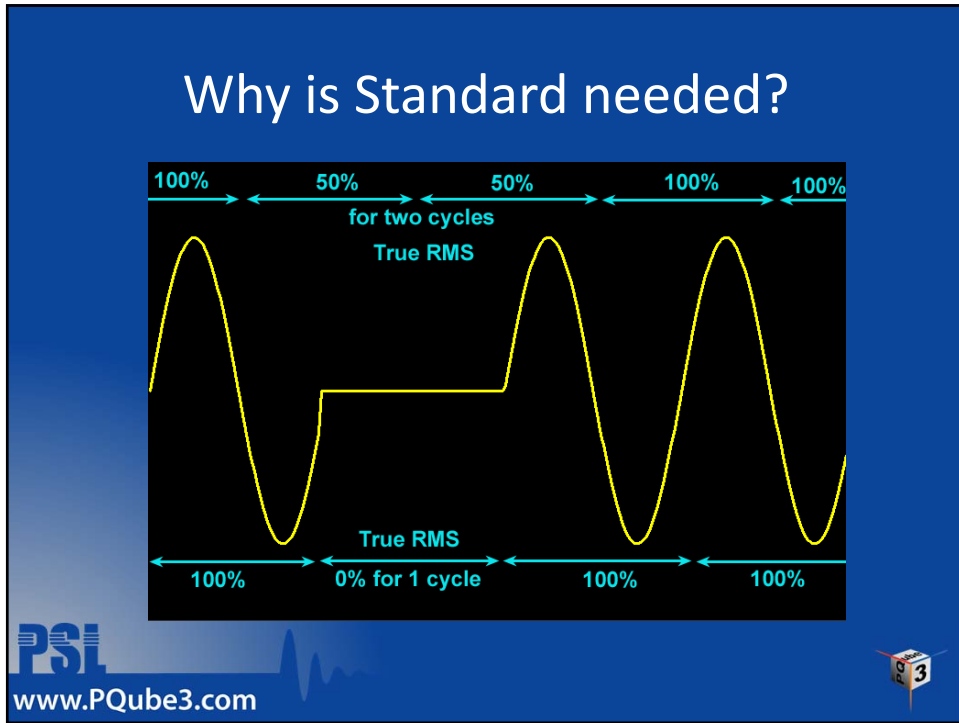
Why is Standard needed?

- Not necessary if there is one correct answer.
- Not necessary if agreement is not important.
- But if there are many correct answers, and agreement is important, we must write a Standards.
- Examples: RMS (root mean square), dip duration



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History of IEC 61000-4-30

- Why? Good PQ instruments, connected to the same signal, provided different readings. A Standard on methods was necessary.
- First Edition of IEC 61000-4-30
 - Started in 1998
 - Published in **2003**
- Second Edition of IEC 61000-4-30
 - Started in 2004
 - Published in **2008**
- **Third Edition of IEC 61000-4-30**
 - Started in 2009
 - Will be published in early 2014



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IEC 61000-4-30 Basics

- Power frequency
- Magnitude of Supply Voltage
- Flicker (see IEC 61000-4-15)
- Unbalance
- Harmonics (see IEC 61000-4-7)
- Interharmonics (see harmonics)
- Mains Signaling
- Over-under deviation



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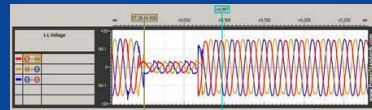
IEC 61000-4-30 Basics

- Supply Dips/Swells
- Voltage Interruptions
- Rapid Voltage Change (RVC)

- Event characterized by its time stamp, amplitude and duration

2000/01/01	T 00:56:59.035	Voltage Sag	0.20%	2.720	File List
2000/01/01	T 00:56:59.055	Interruption	N/A	2.691	File List

- Urms(1/2) or waveform recordings



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IEC 61000-4-30 Basics

- Event Polyphase aggregation
 - 3 phase interruption **only when** all 3 phases amplitudes go below the interruption threshold
 - 3 phase dip **as soon as** 1 phase go below the dip threshold
 - An interruption is also captured as a dip!
- Flagging
 - The measured quantity over an interval may be spurious



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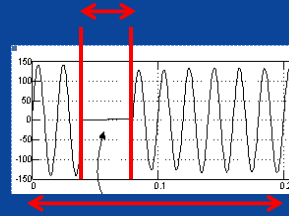


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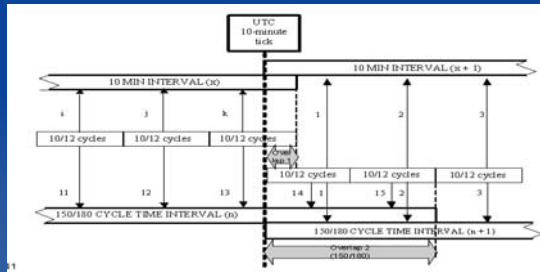
IEC 61000-4-30 Basics

- Time interval aggregation

- Urms(1/2)
- 10/12 cycles



- 150/180 cycles
- 10 min
- 2 hour



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IEC 61000-4-30

Technical challenges for performance Class A

“Different instruments from different manufacturers must report the same accurate parameter values...”

- * measurement synchronization – zero crossing based Urms half cycle)
- * measurement synchronization - 10 min “clock based” = re-synchronization
- * time tagging accuracy (clock external synchronization, clock drift..)
- * all the parameters simultaneously in the same instrument (dips/swells, harmonics, flicker...no gaps !) (processing power)



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IEC 61000-4-30

- Class A – all instruments produce same results
Instruments that meet Class A performance requirements of this standard will, when connected to the same signals, will produce the same results. Class A instruments must meet the highest performance and accuracy requirements in the standard.
- Class S – instruments produce useful survey data
Instruments that meet Class S performance requirements are useful for statistical surveys and contractual applications where there are no disputes. Accuracy and performance requirements for Class S are less stringent than Class A.

Class B

(about to be) obsolete



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What's new in Edition 3?

New! Under- and over-deviation	moved to informative
New! Rapid voltage changes (RVC)	now normative
New! Currents measurements	now normative
New! 2kHz-150kHz emissions meas.	informative



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What's new in 61000-4-30 Ed. 3

- Various corrections, adjustments
- Class B, over-deviation, under-deviation are all moved to Informative Annexes
- Current recording will be required
- RVC (Rapid Voltage Change) events will be required
- 2kHz – 150kHz spectral recording

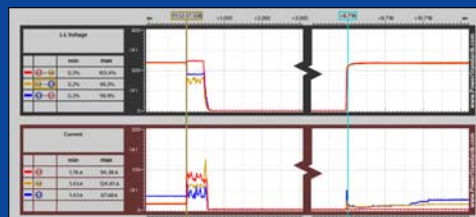


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Recording the Currents in Ed. 3

- Amps as well as volts
- Current is not a power quality event
- Current is useful for understanding PQ events
- So:
 - There are no current-based triggers, only voltage
 - You must record current at the same aggregation level as voltage



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Currents in Edition 3?

- Currents measurements now normative
 - Amplitude $I_{\text{rms}(1/2)}$ and 10/12 cycle I_{rms}
 - Harmonics
 - Interharmonics
 - Unbalance

Uncertainty:

Class A - $\pm 1\%$ of reading in the range of 10% to 100% FS

Note: $I_{\text{rms}(1/2)}$ are aligned with voltage $U_{\text{rms}(1/2)}$



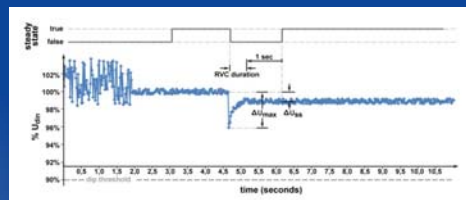
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RVC Added in Edition 3

- Rapid Voltage Change – significant problem in societies with high-impedance grids
- “A quick transition in RMS voltage between two steady-state conditions, during which the voltage does not exceed the dip/swell thresholds.”

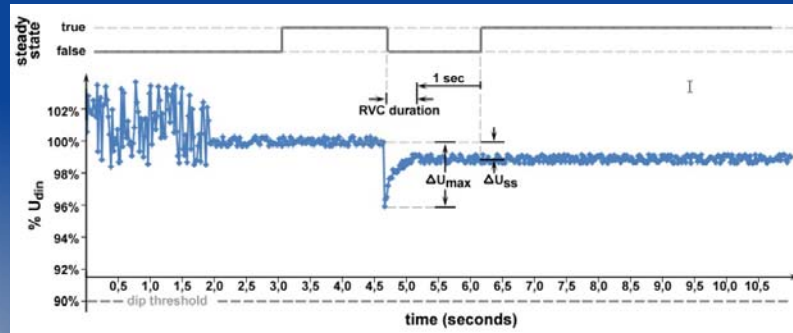


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What's new in Edition 3?

RVC - Well defined measurement method – based on the identification of **2 consecutive steady states**



PSL Note : an excursion beyond dip/swell thresholds is not an RVC

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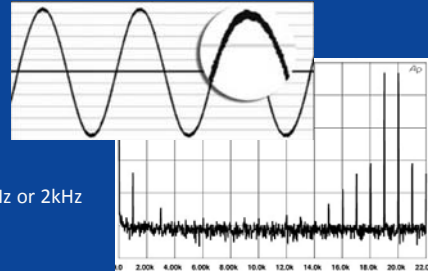
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What's new in Edition 3?

- Measurements in 2kHz-150kHz range
informativ (not mandatory)
- Goal: track "the high frequency" noise on top of the sine wave

- In range 2kHz ~ 9 kHz
method of IEC 61000-4-7 Annex B – 200Hz groups
- In range 9kHz ~ 150 kHz
integer multiple of 200 Hz, preferably 200 Hz or 2kHz
- Reporting at 10/12 cycle intervals
- How to report?



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2kHz-150kHz added in Edition 3

- Increased emissions in this frequency region
- Serious sensitivities in the frequency region
- And no standards! Standards are rapidly coming.
- Measurement method:
 - 61000-4-7 from 2kHz-9kHz, CISPR 16 from 9kHz-150kHz? Very expensive.
 - Phase-to-phase? Phase-to-neutral? Phase-to-earth? Bin widths?
 - Conclusion: use 61000-4-7 with 200 Hz bins from 2-9kHz, and use new low-cost method from 9kHz-150kHz.
 - Massive amounts of data...



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Present status of Edition 3 of IEC 61000-4-30

- CDV (Committee Draft for Voting) issued.



- Please review it carefully, and send comments.
- FDIS (Final Draft International Standard) in early 2014.



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