Application Note
Measurement Techniques

This document identifies the different measuring techniques that can be used by instruments to convert an electrical parameter into a displayed numerical value.

Peak Sensing / RMS Calibrated

The peak value of the waveform is measured and multiplied by a scale factor of 0.707 to get RMS. This is accurate so long as the waveform is a pure sinewave, but significant harmonic distortion or noise spikes could lead to incorrect readings.

Average Sensing / RMS Calibrated

The waveform is usually rectified and an average value is obtained using filters, which is then multiplied by a scale factor of 1.11. This is accurate so long as the waveform is a pure sinewave, but significant harmonic distortion or noise spikes could lead to incorrect readings.

Average or Peak sensing products that are RMS calibrated can be used on 'clean' systems with good levels of accuracy at a low cost. These products can also be used in the presence of harmonic distortion, but there will be an effect on the accuracy.

RMS Compensated

Although the waveform is still measured using average or peak sensing, additional filtering components ensure that the product takes into account the presence of harmonics and distortion. Typically up to 30% of the 3rd harmonic can be tolerated without effecting the measurement accuracy. This is a cost effective compromise for systems where some low order harmonics are present in a system, but where the waveform is still a sinewave. However, high order harmonics or non-sinusoidal waveforms could still lead to incorrect readings.

The example waveform comprises of a fundamental plus 30% of the 3rd harmonic. RMS compensated meters should measure this correctly, while average or peak sensing meters could have significant errors in excess of 10%

True RMS

True RMS sensing is the ideal measurement technique, and will ensure that harmonic distortion and non-sinusoidal wave shapes are accurately measured and displayed. Noise spikes and transients have little effect on this type of meter. True RMS products use high grade components and tend to be more expensive than other types, however, they do offer a higher measurement accuracy in addition to exceptional performance.

Conclusion

True-RMS products will help to future-proof any control panel. If at any future date some new equipment is connected to the monitored supply, a harmonic problem could easily be introduced. True-RMS meters will continue to read accurately in these conditions, whereas other meters could suffer inaccuracy problems and would need to be replaced - a costly exercise.

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