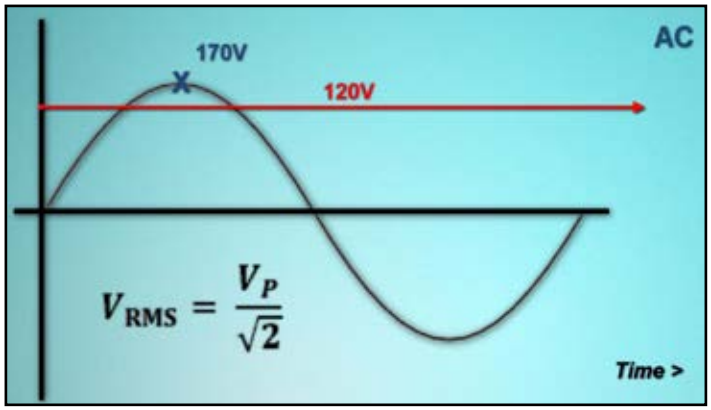
True RMS, True*InRush*®, and True Megohmmeter®

If you're a user of AEMC® instruments, you may have come across the terms True RMS, True*InRush*®, and/or True Megohmmeter®. In this article, we'll briefly define what these terms mean and why they are important to you.

True RMS

The most well-known of these is True RMS, an industry term for a method for calculating Root Mean Square. Root Mean Square, or RMS, is a mathematical concept used to derive the average of a constantly varying value. In electronics, RMS provides a way to measure effective AC power that allows you to compare it to the equivalent heating value of a DC system.

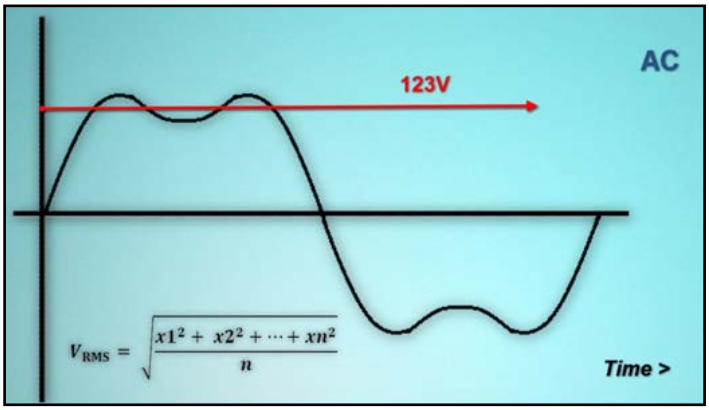
Some low-end instruments employ a technique known as "average sensing," sometimes referred to as "average RMS." This entails multiplying the peak AC voltage or current by 0.707, which represents the decimal form of one over the square root of two.



For electrical systems where the AC cycle is sinusoidal and reasonably undistorted, this can produce accurate and reliable results. Unfortunately, for other AC waveforms, such as square waves, this calculation can introduce significant inaccuracies. The equation can also be problematic when the AC wave is non-linear, as would be found in systems where the original or fundamental wave is distorted by one or more harmonic waves.

In these cases, we need to apply a method known as "true" RMS. This involves a more generalized mathematical calculation that takes into consideration all irregularities and asymmetries that may be present in the AC waveform:

$$V_{RMS} = \sqrt{\frac{x1^2 + x2^2 + \cdots + xn^2}{n}}$$



In this equation, **n** equals the number of measurements made during one complete cycle of the waveform. The higher this number is, the more accurate the RMS calculation will be. This is because the higher the value of **n**, the higher the order of harmonics this formula can accommodate.

Less well-known are the terms True*InRush*® and True Megohmmeter®. These are unique to AEMC®, and represent advanced capabilities not found in competing products.

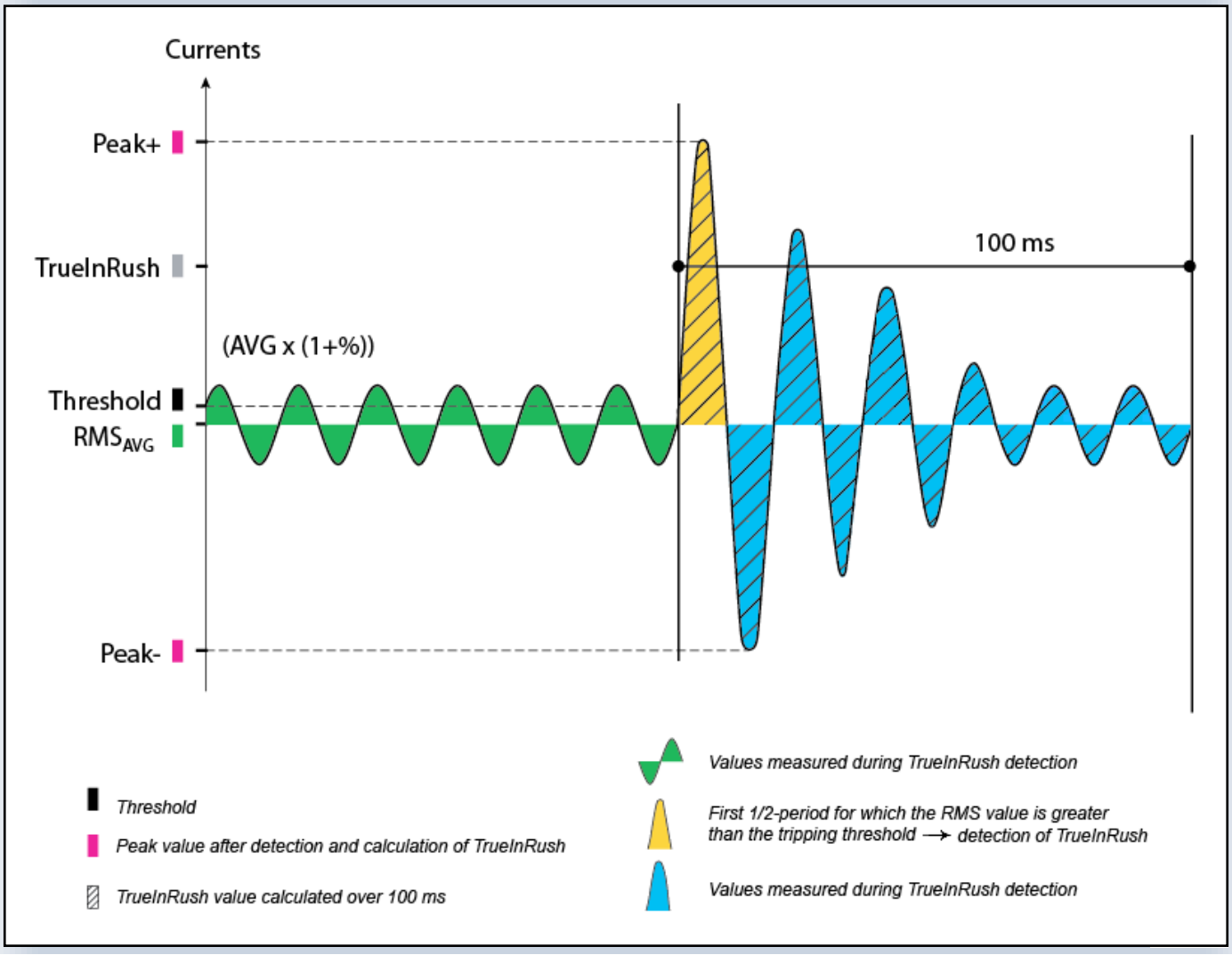
True*InRush*®

When an electrical system or device is turned on, voltage and current initially spike before settling down to steady-state operation. This phenomenon is known as "startup inrush," and it can be an important consideration when monitoring your electrical network for events that could affect the performance of your facility. Inrush is also a critical factor in determining the proper wiring size for your network.

Most instruments can only measure inrush in systems that are initially powered off. Basically, these instruments measure current and voltage starting with the initial powered-down state, through power-up and finally steady state operation. This usually occurs within the first few seconds after start-up. The instrument then compares the power-up peak to steady-state and depending on the threshold criteria used, displays the inrush reading.

AEMC's True*InRush*® function adds the unique ability to measure power-up events from devices added to a network that is already powered on.

In addition to the initial power-up event, True*InRush*® can also detect subsequent power-up inrush events that meet user-defined threshold criteria. True*InRush*® captures all overcurrents, making it simpler and easier to size complex installation correctly.



True Megohmmeter®

Another term unique to the AEMC® world is True Megohmmeter®. To understand its meaning, consider the general principle behind how megohmmeters operate. Basically, these instruments apply a constant voltage to the test conductor, measure current, and then calculate and display resistance in accordance with Ohm's Law.

AEMC® Megohmmeter Model 5070

Unfortunately, holding the voltage constant can be a challenge at lower resistances. To accommodate this, most megohmmeters adjust the voltage level in this situation and continue with the test. This may introduce a level of uncertainty into the data, since ideally all measurements within a test should be made at the same test voltage to ensure a true "apples-to-apples" comparison among the readings.

AEMC's True Megohmmeter® functionality ensures that the test voltage remains constant throughout the test, irrespective of how low the level of resistance. If for any reason the voltage cannot be held constant, True Megohmmeter® instruments will end the test. This ensures complete voltage consistency across all measurements in a test, enabling you to compare results with a high degree of confidence.

Conclusion

This concludes our quick explanation of True RMS, True*InRush*®, and True Megohmmeter®. All three terms speak to AEMC's commitment to providing you with the most reliable and accurate data.