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Measuring True RMS

Just like using a hand-held multimeter to read AC voltages and currents, you can install a DIN package "Instrument Class(tm)" module in your control system to measure and present that same RMS data. Dataforth's DSCA33 True RMS input module provides a single channel of AC input which is converted to its True RMS dc value, filtered, isolated, amplified, and converted to a standard process voltage or current output.

RMS, or Root Mean Square, is a principle measurement of an AC signal. In practical terms, it is the equivalent dc signal that produces the same amount of heat in the same load. Therefore, it directly relates to signal power. For purely sinusoidal signals, the RMS value is the familiar peak amplitude divided by the square root of two. However, for signals comprised either of harmonics or of noncoherent content, this expression becomes increasingly invalid as the harmonic content or noncoherency increases. Typically this is given in terms of a waveform's Crest Factor (C.F.), which is the ratio of its peak value to RMS value. Crest factors start at one for square waves and generallyincrease for more "pointed" signals. True RMS conversion reduces the dependency on sinusoidal purity, thus allowing accurate measurement of signals ranging from pulses to complex nonperiodic waveforms.

Previously, industrial users requiring true RMS conversion were forced to use 'brick' type converters, in-house designs, or those not well suited for typical industrial conditions. The RMS conversion core circuit used in the DSCA33 is identical to those used in high-end digital voltmeters costing thousands of dollars. In addition, the module provides 1500Vrms continuous protection to computer-side equipment and personnel.

The product family consists of 35 ac coupled modules, which accept either voltage or current inputs. Ranges cover 100mVrms to 300Vrms for the voltage models and 1Arms to 5Arms for the current models. All modules operate at frequencies of 45 to 1kHz (standard range), and will also operate from 45Hz to 20kHz (extended range). System-side module outputs are 0-5Vdc, 0-10Vdc, 0-1mA, 0-20mA, or 4-20mA, depending on model.

Measurement accuracy (comprised of calibration accuracy, linearity, repeatability, and hysteresis) is rated at ±0.25% for sinusoidal input (50/60Hz calibration frequency), with an additional ±0.25% of reading over the 45-1kHz standard operating frequency range. Moreover, output ripple and noise is only 0.025% span RMS; greatly surpassing typical industrial converters having ripple and noise 10 to 40 times larger.

For voltage input models, input impedance is a constant 1 Meg ohm in parallel with less than 100pF of capacitance. Continuous overload protection is provided for up to 480V (Peak AC +DC), and transient protection is provided in accordance with ANSI/IEEE C37.90.1-1989. For current input models, the input resistance is a constant 0.10 ohm (1A input) or 0.05 ohm (5A input), thus incurring only a quarter of a volt burden on the source at 5A input current. Up to 10Arms continuous and 50Arms (for one second) can be withstood for the current input modules.

All models operate on wide range power of 15 to 30VDC. For current output models, a dedicated loop supply is provided in the module. Rated operating temperature is from -40°C to +80°C and all modules meet the requirements of EN50081-1 (radiated/conducted emissions) and EN50082-1 (ESD/RF/EFT immunity).