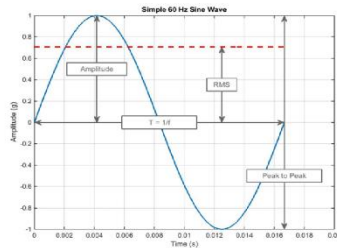


# Title: The difference of the measuring device Rms & True Rms

In measuring alternating current quantities (voltage, current, etc.), the measuring device will measure and display the effective value of the quantity waveform.



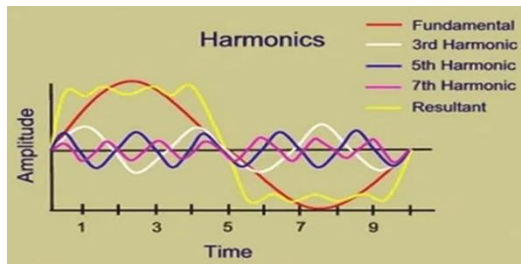
$$V(t) = V_m \sin(\omega t + \theta)$$

$$\text{RMS Value} = \sqrt{\frac{1}{T} \int_0^T [f(t)]^2 dt}$$

In alternating current meters that have a pure sinusoidal waveform, there will be no difference in the measurement of the rms device and the Truerms one, and there will be no measurement error.

But if the waveform of the alternating current quantities is not pure sinusoidal and has harmonics, then there will be a difference between the rms and the truerms measuring device.

In most industries, the waveform of alternating current quantities is not pure sinusoidal due to the use of the following equipment and has harmonics. As a result, errors will appear in the measurements made at this time.



$$f_{rms} = \sqrt{f_{1rms}^2 + f_{2rms}^2 + f_{3rms}^2 + \dots}$$

$$f_{rms} = i_{rms} \quad f_{rms} = V_{rms}$$

The equipment that produces harmonics in industries are:

- Drive motor
- Rectifiers
- Transformers
- UPS devices





Electric arc and induction furnaces, welding machines

AC/DC and DC/DC converters, especially induction motors and remote control circuits

- Single-phase switching power sources in modern electronic consumers such as TV, video, computer, monitor, printer, fax, electronic ballasts, low consumption lamps (LED)

In this case, it is better to use Truerms devices to reduce the measurement time.



Multimeter type	Response to sine wave	Response to square wave	Response to single phase diode rectifier	Response to 3 $\phi$ diode rectifier
				
Average responding	Correct	10 % high	40 % low	5 % to 30 % low
True-rms	Correct	Correct	Correct	Correct