

RESULTS OF MEASURING POWER CONTROLLED BY A PHASE ANGLE FIRED SCR CONTROLLER PC5-7E Watt Transducer

Introduction

Ohio Semitronics, Inc. has long recommended the PC5 series of watt (power) transducers for measuring power when highly distorted or chopped waveforms exist. The PC5 series use Hall-effect multipliers that have a very fast response to changes in current and voltage. The following is the result of a test we performed on an older PC5-7E watt transducer.

Setup

A 12 year old watt transducer (PC5-7E) and an Arbiter 931A Power Analyzer (AR) are both monitoring the same load, a 500 watt lamp, controlled by a simple phase angle controlled SCR. The point of monitoring is between the controller and the load so that both the voltage and current are discontinuous.

Results

The following graph charts the error of the PC5-7E against the Arbiter 931A both as a per cent of reading error and a per cent of full scale. The PC5-7E is rated at $\pm 0.5\%$ of full-scale accuracy. The Arbiter is rated at $\pm 0.05\%$ of reading. The full scale of the PC5-7E is rated at 1500 watts. Since we are measuring a single-phase load, we tied the three elements together so that all are active. In this manner the actual full scale is 500 watts.

The X-axis of the graph shows the power reading of the Arbiter on the bottom line and the reading error in watts of the PC5-7E immediately above the power readings. The maximum observed error was two watts. The meter used with the PC5-7E had three digits.

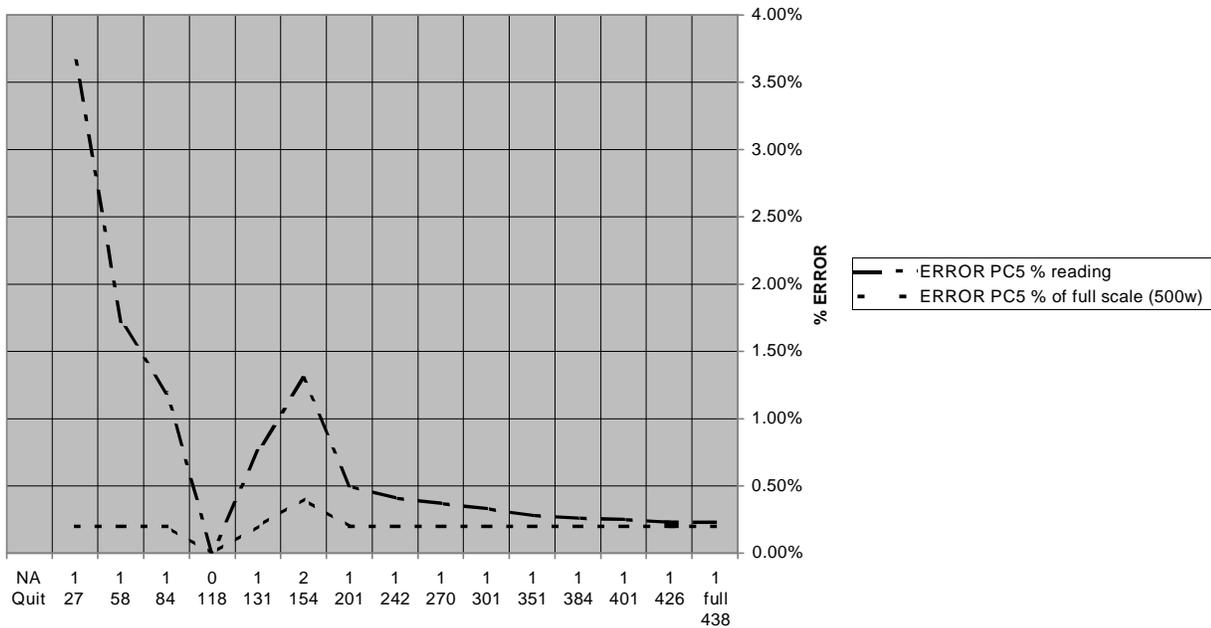
Two things to consider here:

- Both the voltage and current are discontinuous. This alone gives many transducers problems. The PC5-7E does a good job at measuring the true power delivered to the resistive load (a lamp rated at 500 watts @ 130volts) even with the discontinuity and resultant harmonic distortion. At the lowest power reading the harmonic distortion is approximately 80%.

- The PC5-7E is 12 years old and was in continuous service. When we received it back from the customer it was still within specification for a new transducer. This shows excellent long-term stability.

PC5	AR	NOTES	ERROR	ERROR	ERROR
Watts	Watts		Watts	PC5	PC5 % of full
				% reading	scale (500w)
437	438	full	1	0.23%	0.20%
425	426		1	0.23%	0.20%
400	401		1	0.25%	0.20%
383	384		1	0.26%	0.20%
350	351		1	0.28%	0.20%
300	301		1	0.33%	0.20%
269	270		1	0.37%	0.20%
241	242		1	0.41%	0.20%
200	201		1	0.50%	0.20%
152	154		2	1.30%	0.40%
130	131		1	0.76%	0.20%
118	118		0	0.00%	0.00%
83	84		1	1.19%	0.20%
57	58		1	1.72%	0.20%
26	27		1	3.70%	0.20%
19	Quit		NA		

PC5-7E ERROR ON PHASE ANGLE FIRED SCR CONTROLLED LOAD.
 Transducer is 12 years old and used.



Power in watts, range from 27 to 438 watts. Phase angle controlled.