Burden Rating of Voltage Transformers And the Impact on Accuracy Performance

Technical Bulletin # 101

Accuracy ratings of voltage transformers (VTs) are stated as a function of standard burdens, according to the following chart from IEEE C57.13:

Characteristics on standard burdens*			Characteristics on 120 V basis			Characteristics on 69.3 V basis		
Designation	*VA*	*Power factor*	*Resistance ( )*	*Inductance*	*Impedance ( )*	*Resistance ( )*	*Inductance*	*Impedance ( )*
W	12.5	0.10	115.2	3.0400	1152	38.4	1.0100	384
X	25.0	0.70	403.2	1.0900	576	134.4	0.3640	192
M	35.0	0.20	82.3	1.0700	411	27.4	0.3560	137
Y	75.0	0.85	163.2	0.2680	192	54.4	0.0894	64
Z	200.0	0.85	61.2	0.1010	72	20.4	0.0335	24
ZZ	400.0	0.85	30.6	0.0503	36	10.2	0.0168	12

Figure 1 – VT Standard Burden

For example, a VT rated 0.3 WXMY will maintain a 0.3 accuracy class from 0 VA to 75 VA (“Y” burden).

VT accuracy performance changes linearly with burden and can be plotted as follows:

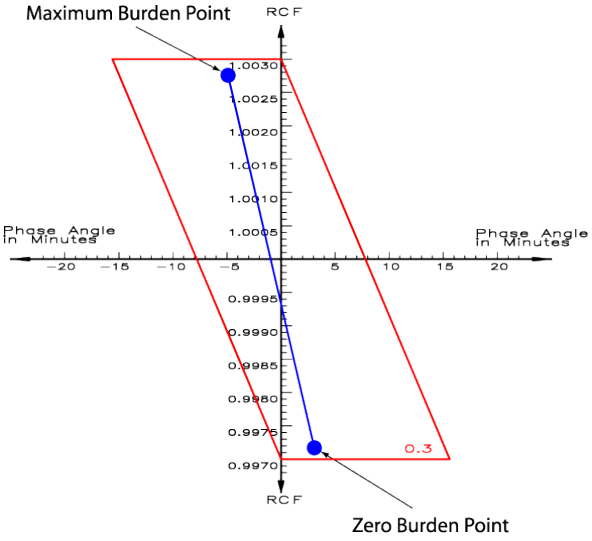

Figure 2 – VT Load Line

Ritz Instrument Transformers, Inc.
25 Hamburg Avenue
Lavonia, Georgia 30553

(706) 356-7180
(866) 772-5245 (fax)
sales@ritzusa.com
www.ritzusa.com

Some points to consider when applying VTs for metering and protection applications:

- Modern electronic instruments present very low burdens to the VT secondary circuit. Most electronic meters and relays draw less than 1 VA each. Rarely does the burden of a VT circuit exceed 10 VA for modern installations.
- VT manufacturers tend to design VTs to utilize the entire accuracy parallelogram in order to minimize copper and core steel costs. Therefore the zero burden point of VTs tends to be near the bottom of the accuracy limits and the maximum burden point tends to be near the top of the accuracy limits.
- Accuracy is measured and recorded in the factory at zero and full rated burden. From these two measurements, accuracy performance at any other burden can be plotted by moving linearly and proportionally between the zero and full burden point. For example, for a VT rated with a "Z" burden, or 200 VA, if the VT was loaded at 100 VA, the actually accuracy performance point would be in the center of the load line, or 50% of full rated burden.

Given that modern applied burdens are relatively low, true accuracy performance can actually be improved by utilizing a VT with a lower full burden rating. The following two plots illustrate this point. Figure 3 is a 10 VA operating point plotted for a VT with an accuracy rating of 0.3 WXMYZ (200VA) and Figure 4 is a plot of the same operating point plotted for a VT with an accuracy rating of 0.3WXMY (75VA).

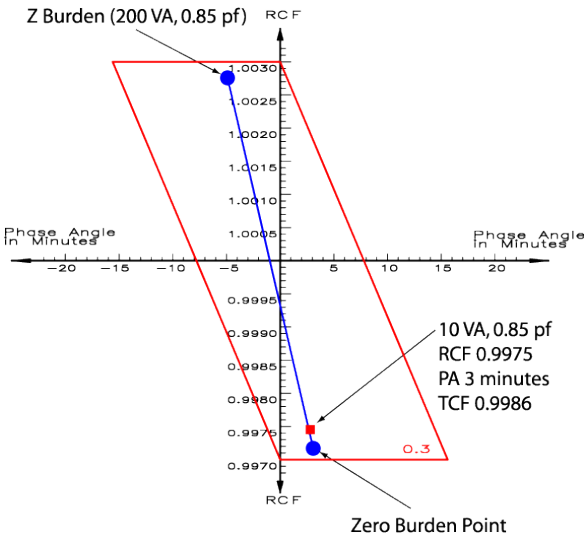

Figure 3 – Z burden VT

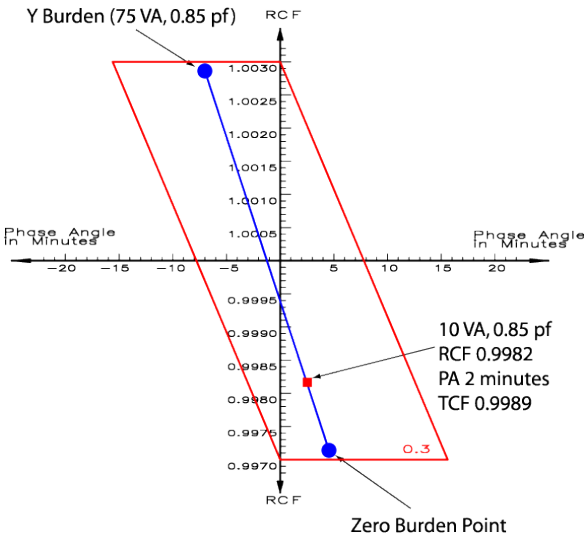

Figure 4 –Y burden VT

The conclusion can be made that for almost any modern application, improved accuracy performance can be gained by purchasing VTs with lower full rated burdens, which result in smaller and more economical units.

Ritz Instrument Transformers, Inc.
25 Hamburg Avenue
Lavonia, Georgia 30553

(706) 356-7180
(866) 772-5245 (fax)
sales@ritzusa.com
www.ritzusa.com