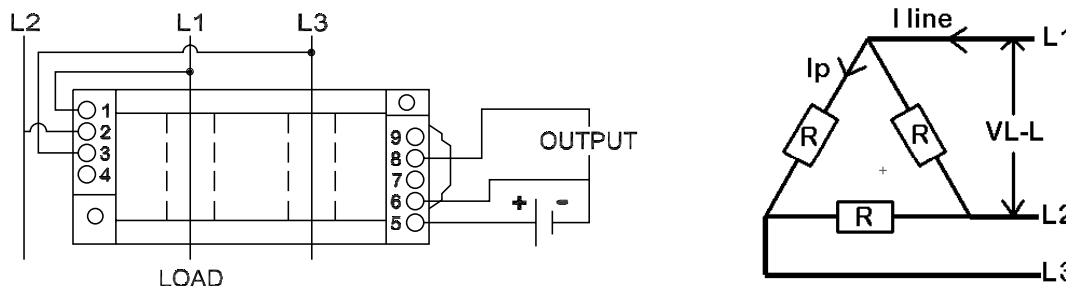


# Active Power Measurement with the CR6230/40 Power Transducer

The CR6230 and CR6240 series of Power Transducers gives the designer a simple and effective way to measure and record the instantaneous power usage for 3 – phase 3 – wire loads. These devices are also known as 2 element power transducers. Only two current inputs are needed because 3 – wire power systems do not have a neutral return path, and one of the lines can always be modeled as the sum of the other two. Hence, these Delta connections can be measured with 2 current sense points.



- Calculation of full scale output:** Using a CR6230-500-5 for example, the unit is calibrated to output the fullscale reading when a balanced purely resistive load is being powered by 500 Vrms line to line, and the amount of current draw on each leg is 5 Arms. Power in any one leg will be the volts across the leg times the current through the leg times the power factor. For calibration, the value of the power factor is unity (1) for a purely resistive load. For the above diagram, the voltage across the element is  $V_{L-L}$ , or 500Vrms. The current is  $I_p$ , which for balanced loads is  $I_{line}$  divided by the square root of 3 (1.732). Thus, the power in one of the legs for a full scale reading using a 500-5 unit would be  $500 \times 5/1.732 = 1,443$  Watts. There are then 3 legs on a 3-phase line, so the total power, full scale would be  $3 \times 1,445 = 4,330$  Watts. The 500-5 transducer will output fullscale (5VDC or 20mA) when the power being used is 4,330 Watts. Using this same methodology, the following simplified formula will give the full scale reading from any Delta transducer: Part number CR6230 – AAA - BB, **Full scale in Watts = AAA X BB X 1.732.**
- External current transformers and voltage transformers** can be used to extend the reading range of any transducer. Voltage and current transformers are sized according to turns ratio. A turns ratio on a current transformer of 100:5 represents a turns ratio of 100/5 or 20. Thus for every 1 amp from the current transformer, this represents 20 Amps in the measured line. Since power =  $V \times I \times PF$  (power factor), the amount of power measured when using external current and voltage transformers will be  $V \times I \times PF \times$  current ratio  $\times$  voltage ratio. Using our same example as before, with a CR6230-500-5, if an external current transformer with a ratio of 20 is used, as well as an external voltage transformer with a ratio of 2, then the new full scale output of the transducer will equal  $4,330 \times 20 \times 2 = 173,200$  Watts!!! A simplified formula for this situation is: **Full Scale Watts = AAA X BB X 1.732 X CT ratio X VT ratio.** Please refer to "Selecting ANSI Class Metering Current Transformers" and "Using External Current Transformers with Other CR Devices" for more information on transformer ratios and applying external transformers to transducers and other devices.