How to measure the firing angle (alpha) and distinction angle (gamma)

There are several ways to measure the firing angle (alpha) and distinction angle (gamma).

Firing angle measurement:

A pulse for each valve can be generated by setting a flip-flop with the line-line voltage zero crossing detection pulse and resetting it with the firing pulse. The width of this pulse is proportional to the valve firing pulse. Analog addition of all such digital signals produces a signal the average value of which is the value of alpha.

Attached is a simple example case which generates the detection pulse. You only need to take the average of this signal to produce the angle alpha.

Extinction angle measurement:

The extinction angle, gamma, can be measured in a similar manner used for alpha measurement. The basic SR flip-flop for determining the extinction angle is now set using an indication that the thyristor has achieved zero current and reset with the positive zero crossing of the line-line voltage. An indication of zero current can be achieved using the trailing edge of the signal di/dt which is non-zero only during overlap. Alternatively, the negative transition of valve voltage could also indicate this event. As in the alpha measurement, the outputs of the 6 flip-flops can be summed to get an analog value which determines, in its average, the value of the extinction angle.