The power consumed by AC electric motors in industry is very important. Since AC motors are wound devices, they consume inductive power. In terms of electrical efficiency, apparent power and active power should be close to each other, in which the \( \cos \phi \) value should approach one. In this case, it is important to know the reactive power it consumes. If the phase difference between current and voltage can be calculated, we can learn the reactive power of AC motors.

In the project we have done, we have designed a device that calculates the phase difference between current and voltage of single-phase AC motors. The device notifies the user of the results it has obtained through the screens it has on it, and in cases where the user cannot interact with the device directly, user can check the data on the internet.

The working principle of the algorithm we use when calculating the phase difference is as shown on the right. Voltage value is taken as reference. When the voltage value is greater than zero, each value taken is compared with the value taken in the previous cycle, the point where the current value is less than the previous value is recorded as the peak. The same thing is repeated for the data from the current sensor and the time difference between the two peaks is found. The phase difference is calculated with the formula:

\[
PD = \frac{\text{difference between peaks}}{\text{Period}} \times 360
\]

The fact that the microcontroller is dual-core causes the measurements to give more accurate results. In the first core, the data is received from the sensor without loss, while in the other core, the necessary processes are carried out to publish the results.

Today, the internet is at the center of life in a location that everyone can easily access and use. While this is the case, we, technology developers must provide access to the internet in our projects. By connecting the test and measurement integrated device for the AC motors we have built to the internet, we have enabled users to access the data online. We published the data on the ThingSpeak platform, which is frequently used by IoT developers, with the WiFi module included in the ESP32.