Essentially, an Arduino microcontroller comprises of Atmel microprocessor, USB serial programmer and power regulator units. Technical facilities for Arduino are given in Appendix A. The features of the Arduino Mega ADK include the Atmel 2650 processor, 54 digital I / O pins that can be used as 16-pulse PWM (Pulse Width Modulation) outputs, and 16 input pins that each of them are 10-bit analogue. It has a 256 KB flash memory totally. There are 4 UART communication pins that one of them is for programming.

The specificities of the microcontrollers are rather sufficient for iDev project. There is need for one digital input pin to turn on/off the iDev. Moreover, there is also need for two analogues and two digital input pins to measure voltage, current, frequency and cos φ values of energized plug.

Different types of sensors and devices can be supported at the same time with microcontrollers that the design of it brings multitenancy. Hence, a temperature and humidity sensor is assembled to iDev in order to measure the temperature and humidity of the environment.

Following the design of iDev is completed, it is tested with a calibrated HIOKI brand device which can make accurate measurements, in order to determine the accuracy of the measured values. The results of test measurements indicate that measurements can be made with maximum of % 2 accuracy.

It is seen in the literature that such embedded systems or microcontroller applications are specific according to project. In other words, the code that is used to control microcontroller is specific to application and it is difficult or impossible to make changes on the project or make an attachments to it. In order to overcome this problem a new system which is able to read the sensors and transmit data in spite of the type and intended use of sensors that can be mounted on them is designed. The main advantage of this system is opportunity of the standardized software usage by downloading it to another microcontroller in case of breaking down of the microcontroller. In addition, any microcontroller used elsewhere in the system can be removed and replaced directly, without any hardware or software modifications, in case of breaking down or alteration.

Development, maintenance, repair and training cost are minimized by this code standardization. Moreover, various applications that are required to be done can be realized in a simpler way.

Following the standardizing the codes, the electronic circuit is designed for microcontroller to switch the grid voltage and to read the voltage, current, frequency and cos φ. While the electronic circuit is being designed, the studies are performed by considering operating current and voltage of microcontrollers and other devices. The main objective of design is to make it practical, applicable, cost effective and coherent. Relay is preferred because of its ease applicability and cost advantage for switching operation.

In order to measure the grid voltage, step down transformer is used. Since the microcontroller only measures direct current, the output of the transformer is rectified and reduced with divider voltage resistors to keep it in the measurement limits of microcontroller.

The AC voltage from the step down transformer is rectified by low power single diode, filtered with fairly low power capacitance and connected to one of the analogue inputs of microcontroller in order to make measurement. In order to detect the minor variations in grid voltage, it is not rectified by full-wave and bridge diodes that can give better output and capacitor and filter circuits that can filter better. Half-wave rectification with a single diode reacts much faster than other rectification methods. The higher the quality of the rectifier and filter circuit, the more stable the voltage output will be, as the fluctuations from the network will compensate so well. This contradicts the aim of detecting the voltage sensitively, in other words detecting the small changes in grid voltage for his project. While calculating the voltage divider resistors, it has to be considered that analogue inputs of microcontrollers can stand to 5V DC voltage maximally. It is calculated by adding the safety margin that input voltage has to be 4V DC since maximum 5V DC voltage can be used. All calculations are made in according to 4V DC input value.

Since it is known that the main used voltage is 220 V AC, the voltage drop transformer ratio and the voltage divider resistors are selected as 100/1 in order to simplify the calculations. 2.2V DC voltage is provided to Arduino microcontroller as input voltage at the end of calculations. Microcontroller’s input voltage drops to 2.1V DC following the grid voltage drops to 210V AC. Microcontroller’s input voltage steps up 2.3V DC following the grid voltage steps up to 230V AC. If there is maximally 400V AC input, the input voltage of microcontroller can only be 4V maximally. Because of the input voltage can stands up to 5V, damage to the microcontroller is prevented consequently.

The rectifier which is at the output of step down transformer and voltage input at the output of filter elements are calculated as 6V DC when the grid voltage is 220V AC. The calculations are made in according to the resistance which feeds the analogue input of microcontroller is 2.20V voltage. The voltage of other resistor which is in voltage divider circuit is 3.80V. Total voltage is 2.20 + 3.80 = 6.00 V DC. According to this calculations, if the resistance which is connected to the analogue input of the microcontroller is 2.20 units, the other resistance value has to be 3.8 units. Resistance values have to be calculated correctly. It is aimed to consume minimum power due to minimum current is drawn from the rectifier and filter circuit. If the voltage divider resistance values are kept low, both the power consumption increases and the desired response speed cannot be obtained due to the excessive load on the rectifier and filter circuit. Conversely, when the voltage divider resistance values are too large, sufficient current pass is not provided for microcontroller to measure. Therefore, measurements result incorrectly.

The voltage from the microcontroller to analogue inputs is measured with 10 bit A / D converter (analogue digital converter) that is integrated into the microcontroller by converting it to digital. Since the microcontroller can accept input as a maximum of 5V DC, it corresponds to 10 bits i.e. 210 = 1024. It means that measurements can be made with 5/1024 = 0.00488 V, approximately 5mV, sensitivity. Since our measurement cycle ratio is 100/1, it means that the grid voltage measurement can be made with 0.005V x 100 = 0.5 V sensitivity. This obtained sensitivity is sufficient for the needs of