WI-FI Smart Power Meter

Purpose of the paper

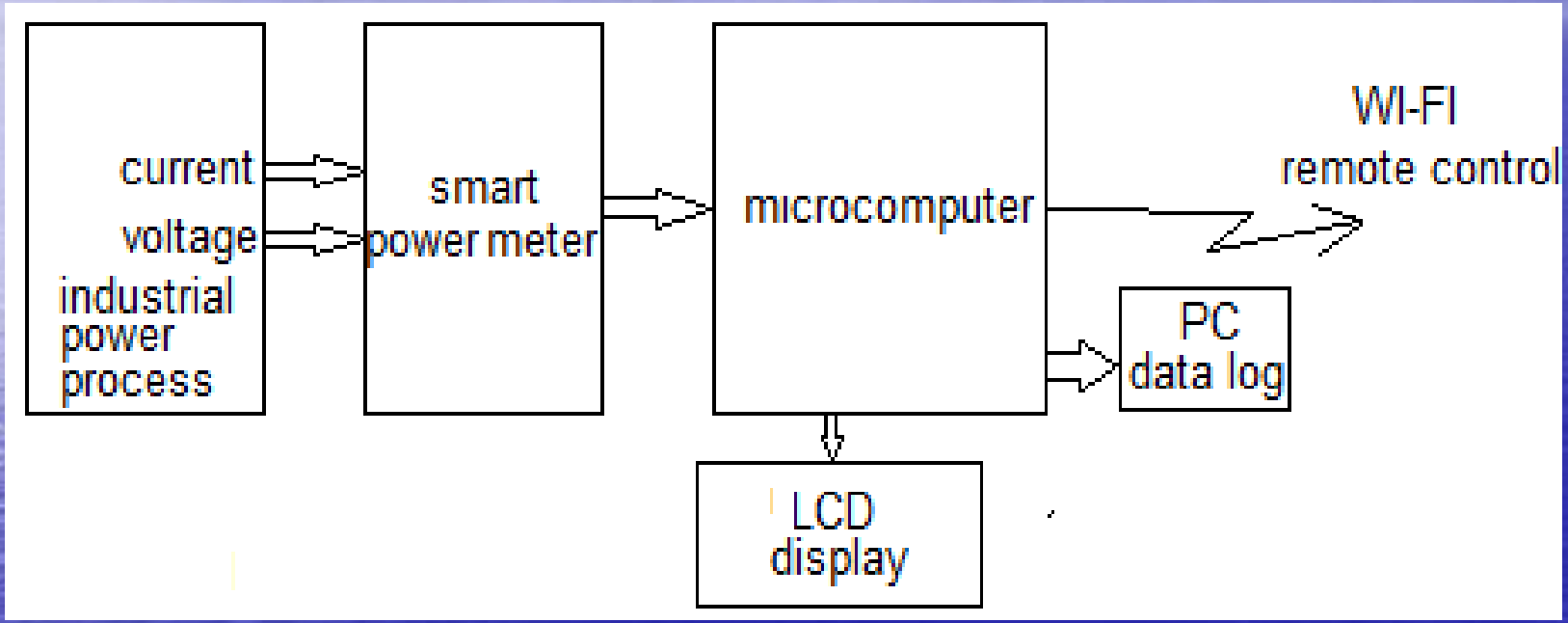
- Design and of a practically realized on process Smart Power meter
- The application is intended for data collection for the voltage, the current in processing plants

- By processing them, data on power, energy, frequency and power factor are obtained. These quantities are visualized on an LCD display, stored in an excel log file, and are distributed on the Internet via a WI-FI interface.

- The solution was realized with the smart power module PEZ004 and Node MCU ESP 8266.

The data for energy consumption in industrial process plants are essential for the efficient operation of the work process. On the basis of the data on the consumed energy, on the one hand the production process can be planned, and on the other hand it is possible to take measures to improve the efficiency and reduce the energy consumption .

Block diagram on one smart power system for energy and power measurements

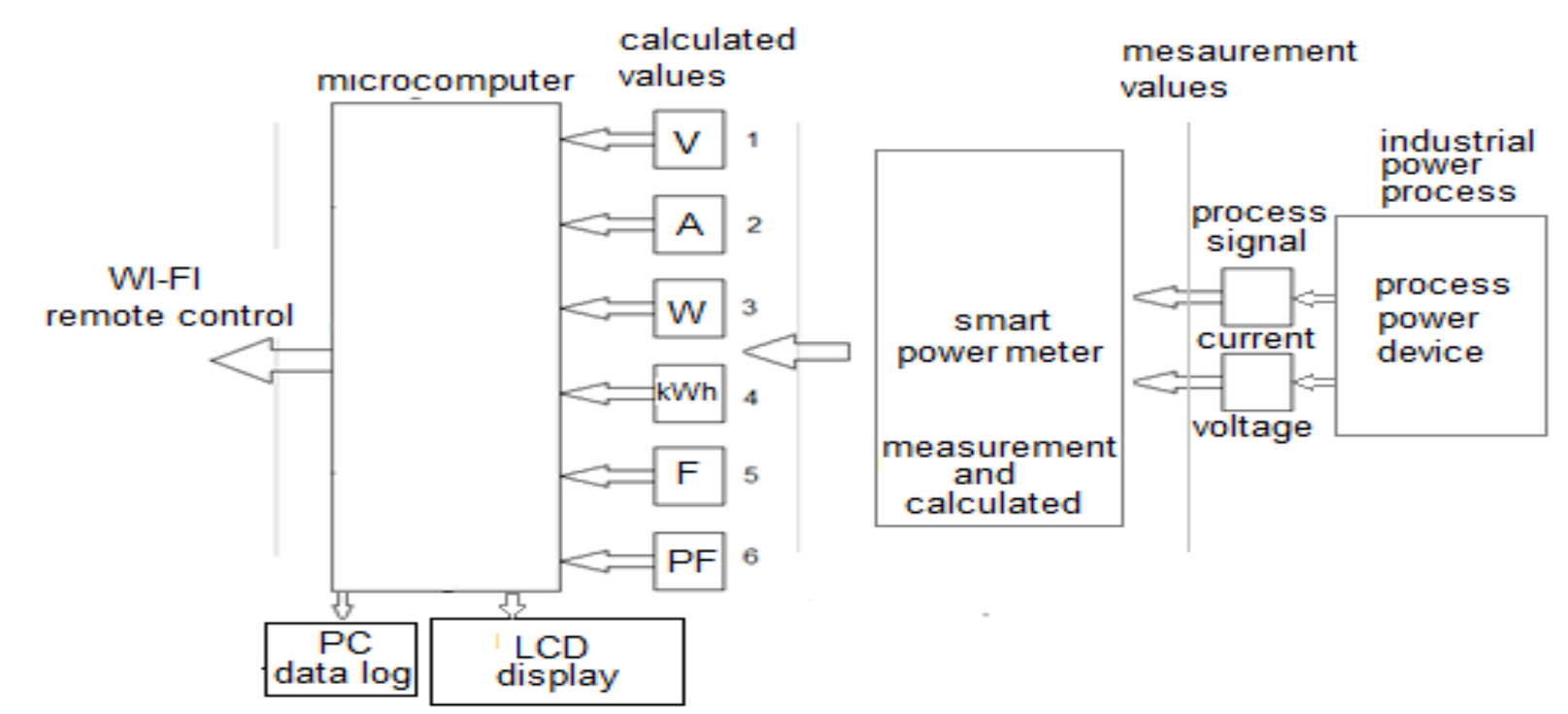


Smart power system is based on microcomputer. It collects data on the quantities of current and voltage in industrial power process and calculated data for energy and power.

The microcomputer sends this data to the Internet with a Wi-Fi modem .

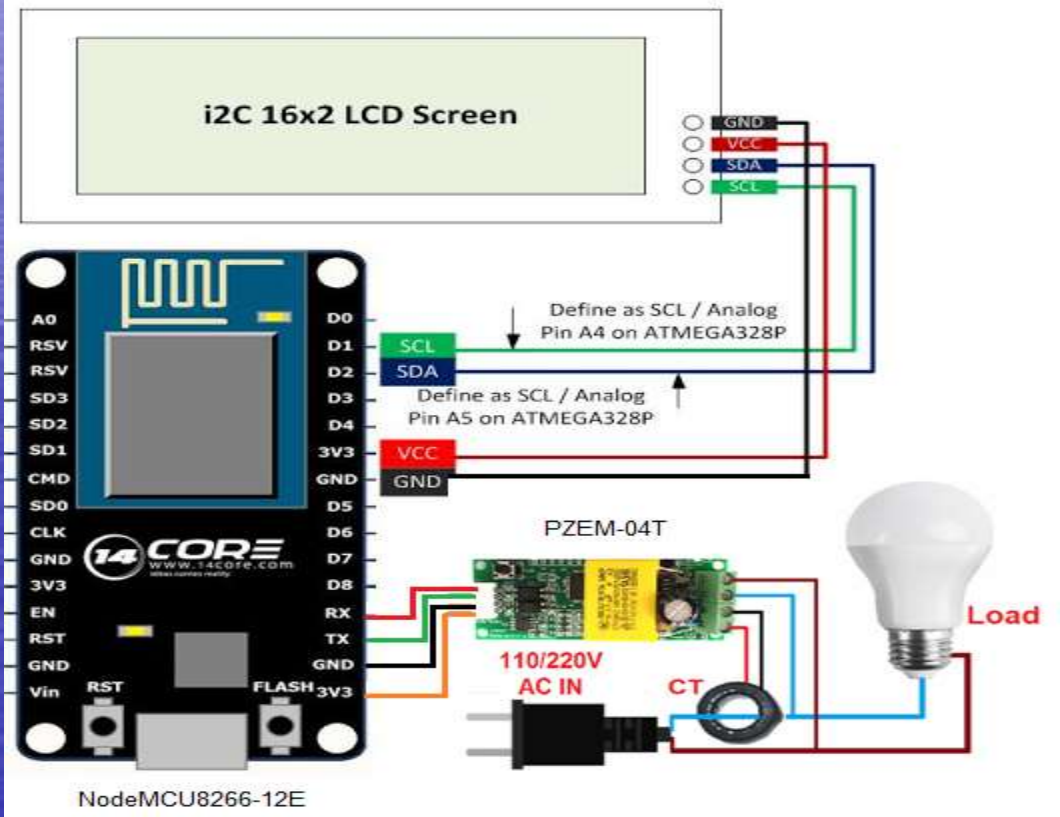
The microcomputer with the UART port it is connected to a personal computer to which it sends the data to the Intra network.

Block diagram of the specific solution of WI-FI smart power meter



The main part of this WI-FI smart power meter is the microcomputer. In the solution is selected the NodeMCU ESP8266 and Power Meter PEZ004.

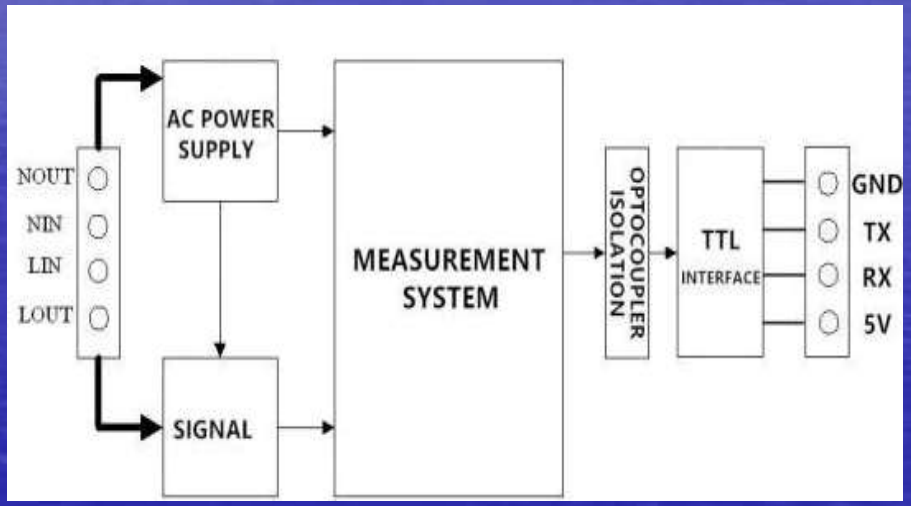
Connection diagram of the realized solution



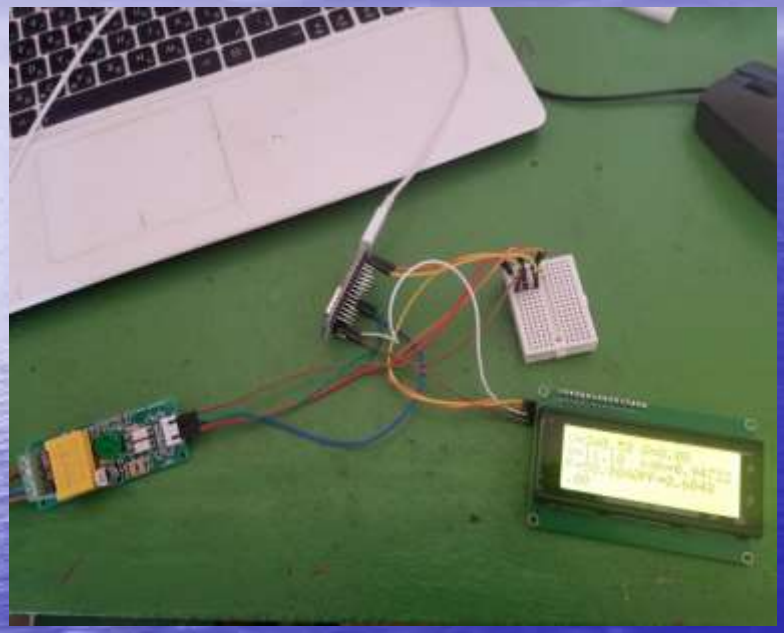
NodeMCU ESP8266 Specifications & Features

- Microcontroller: Tensilica 32-bit RISC CPU Xtensa LX106
- Operating Voltage: 3.3V
- Input Voltage: 7-12V
- Digital I/O Pins (DIO): 16
- Analog Input Pins (ADC): 1
- UARTs: 1
- SPIs: 1
- I2Cs: 1
- Flash Memory: 4 MB

PZEM-004T power meter

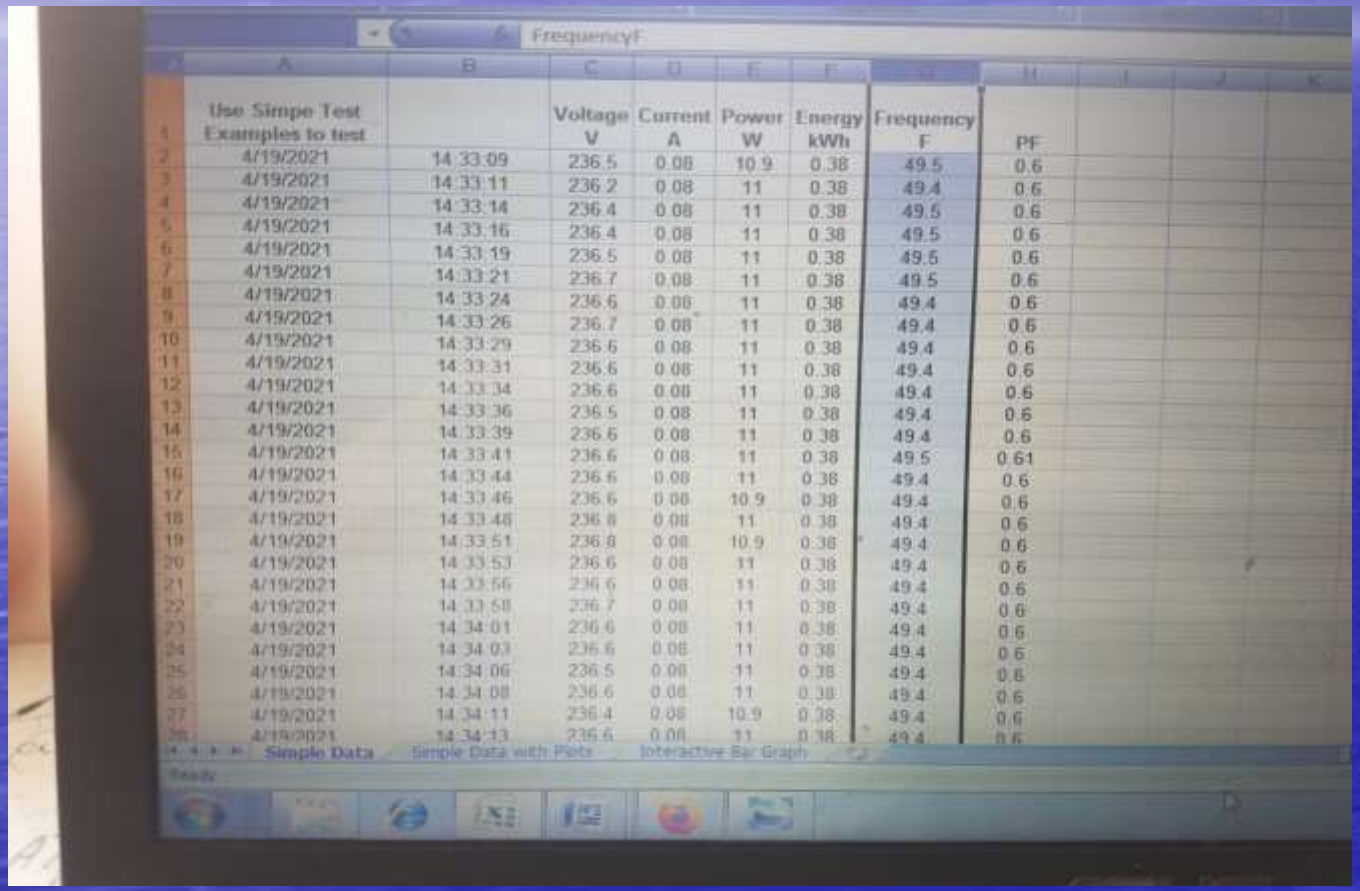


Experimental results



prototype on the WI-FI smart power meter and the complete process WI-FI smart power meter

Excel data log file



Use Simpe Test Examples to test		Voltage V	Current A	Power W	Energy kWh	Frequency F	PF
4/19/2021	14:33:09	236.5	0.08	10.9	0.38	49.5	0.6
4/19/2021	14:33:11	236.2	0.08	11	0.38	49.4	0.6
4/19/2021	14:33:14	236.4	0.08	11	0.38	49.5	0.6
4/19/2021	14:33:16	236.4	0.08	11	0.38	49.5	0.6
4/19/2021	14:33:19	236.5	0.08	11	0.38	49.5	0.6
4/19/2021	14:33:21	236.7	0.08	11	0.38	49.5	0.6
4/19/2021	14:33:24	236.6	0.08	11	0.38	49.4	0.6
4/19/2021	14:33:26	236.7	0.08	11	0.38	49.4	0.6
4/19/2021	14:33:29	236.6	0.08	11	0.38	49.4	0.6
4/19/2021	14:33:31	236.6	0.08	11	0.38	49.4	0.6
4/19/2021	14:33:34	236.6	0.08	11	0.38	49.4	0.6
4/19/2021	14:33:36	236.5	0.08	11	0.38	49.4	0.6
4/19/2021	14:33:39	236.6	0.08	11	0.38	49.4	0.6
4/19/2021	14:33:41	236.6	0.08	11	0.38	49.5	0.61
4/19/2021	14:33:44	236.6	0.08	11	0.38	49.4	0.6
4/19/2021	14:33:46	236.6	0.08	10.9	0.38	49.4	0.6
4/19/2021	14:33:48	236.8	0.08	11	0.38	49.4	0.6
4/19/2021	14:33:51	236.8	0.08	10.9	0.38	49.4	0.6
4/19/2021	14:33:53	236.6	0.08	11	0.38	49.4	0.6
4/19/2021	14:33:56	236.6	0.08	11	0.38	49.4	0.6
4/19/2021	14:33:58	236.7	0.08	11	0.38	49.4	0.6
4/19/2021	14:34:01	236.6	0.08	11	0.38	49.4	0.6
4/19/2021	14:34:03	236.6	0.08	11	0.38	49.4	0.6
4/19/2021	14:34:06	236.5	0.08	11	0.38	49.4	0.6
4/19/2021	14:34:08	236.6	0.08	11	0.38	49.4	0.6
4/19/2021	14:34:11	236.4	0.08	10.9	0.38	49.4	0.6
4/19/2021	14:34:13	236.6	0.08	11	0.38	49.4	0.6

Simple Data | Simple Data with Plots | Interactive Bar Graph

Screen of an Android mobile device on which are showing the current values of the measurement data

Conclusions

- In paper with theoretical analysis is designed and practically realized WI-FI smart power meter.
- The power meter allows data on power, energy, frequency and power factor to be obtained only by measuring the voltage and current of a process device
- Then these data are processed, visualized on an LCD screen, sent as a data log in an excel file and distributed remotely via a WI-FI connection
- The solution also provides the ability for upgrade to remote transfer on the data over the internet