

NASOS QURILMASINING ELEKTR PARAMETRLARINI MONITORING QILISH METODI

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ANNOTATSIYA

Maqolada nasos qurilmasining elektr parametrlarini bo'lgan tok, kuchlanish va quvvat to'g'risidagi ma'lumotlarni PZEM-004T qurilmasi orqali monitoring qilish metodlari hamda qurilmani mikrokontrollerga bog'lash va uni dasturlash orqali uni ishlatish to'g'risida ma'lumotlar va dastur kodlari keltirilgan. Bundan tashqari qurilmani TTL port orqali kompyuterga ulash sxemasi va kompyuterda monitoring ma'lumotlarini ko'rsatuvchi Serial oynasi keltirilgan.

Kalit so'zlar. Nasos, elektr parametrlar, tok, kuchlanish, quvvat, quvvat koeffitsienti, PZEM-004T, arduino, monitoring, o'lchov transformatorlari.

МЕТОД МОНИТОРИНГА ЭЛЕКТРИЧЕСКИХ ПАРАМЕТРОВ НАСОСНОГО УСТРОЙСТВА

АННОТАЦИЯ

В статье описаны методы контроля данных о токе, напряжении и мощности, которые являются электрическими параметрами насосного устройства, посредством устройства ПЗЭМ-004Т, а также сведения о подключении устройства к микроконтроллеру и использовании его путем его программирования и программы. коды указаны. Кроме того, представлена схема подключения устройства к компьютеру через порт TTL и окно Serial, показывающее данные мониторинга на компьютере.

Ключевые слова. Насос, электрические параметры, ток, напряжение, мощность, коэффициент мощности, PZEM-004T, arduino, мониторинг, измерительные трансформаторы.

METHOD OF MONITORING THE ELECTRICAL PARAMETERS OF THE PUMP DEVICE

ABSTRACT

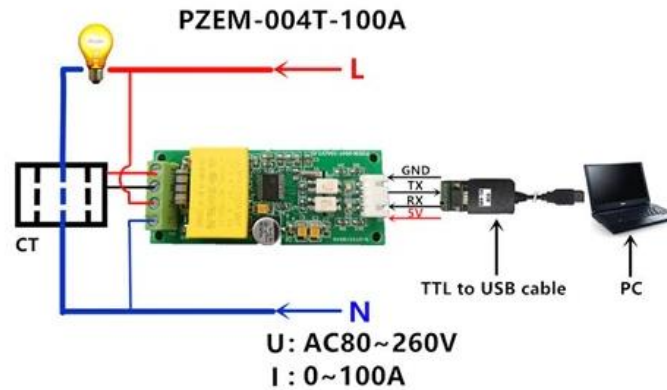
The article describes the methods of monitoring current, voltage and power data, which are electrical parameters of the pump device, through the PZEM-004T device, as well as information on connecting the device to a microcontroller and using it by programming it, and program codes are listed. In addition, the scheme of connecting the device to the computer through the TTL port and the Serial window showing the monitoring data on the computer are presented.

Keywords: Pump, electrical parameters, current, voltage, power, power factor, PZEM-004T, arduino, monitoring, measuring transformers.

Nasos agregatlarini ratsional (oqilona) tanlash masalasi suv ta'minoti va suv chiqarib tashlash tizimlarini loyihalashtirishda hamda foydalanishda muhim ahamiyatga ega. Mazkur tizimlarning tejamliligi ishlashi to'g'ri tanlangan nasos agregatlari, ularning (optimal) maqbul ish rejimining tanlanishiga bog'liq. Eng kata foydali ish ko'rsatkichi bilan elektr energiyasini maksimal tejab ishlaydigan nasoslarni tanlash uchun ularning xossalari bilan tanish bo'lish va ularning tavsifidan foydalana olish zarur [1, 3].

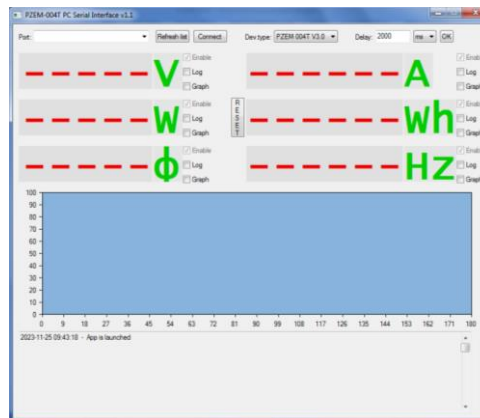
Hozirga kelib nasos qurilmalarining elektr iste'molini nazorat qilish dolzarb hisoblanadi. Bunda uning iste'mol toki, tarmoq kuchlanishi, yuqori garmonika toklari, iste'mol quvvati kabi bir necha elektr parametrlarini monitoring qilish asosida nasos qurilmasining ish unumdorligi baholanadi. Bunday asosiy parametrlardan biri nasos elektr yuritmasining quvvat koeffitsiyenti $\cos\phi$ ni iqtisodiy ahamiyati shundan iboratki, uni miqdori kapital va ekspluatatsion sarflar, elektr qurilmalari jixozlaridan foydalanish samaradorligiga bog'liq. Tarmoq kuchlanishi va undagi yuqori garmonikalarning mavjud bo'lishi bevosita nasos elektr yuritmasining reaktiv quvvat iste'molini oshishiga olib keladi [2-5].

Nasos elektr yuritmasining energiya tejamliligi va undagi mavjud salbiy elektr kattaliklar to'g'risida ma'lumot olish uchun ularni real vaqt mobaynida monitoring qilish muhim ahamiyatga ega. Hozirda kichik va o'rta quvvatli nasos qurilmalarining elektr yuritmalarini monitoring qilishda PZEM-004T qurilmasidan keng foydalanib kelinmoqda. Ushbu qurilma yordamida elektr yuritmaning iste'mol toki, quvvati, quvvat koeffitsiyenti, tarmoq kuchlanishi va chastotasi to'g'risida ma'lumotlar olish mumkin. Olingan ma'lumotlar asosida monitoring amalga oshiriladi (1-rasm) [2-4, 7].



1-rasm. PZEM-004T qurilmasi.

PZEM-004T moduli Peacefair deb nomlangan kompaniya tomonidan ishlab chiqariladi, 10 Amper va 100 Amper modellari mavjud. Ularda tokning qiymati tok transformatorlari orqali kerakli qiymatga pasaytiriladi va qurilmaga ulanadi. PZEM-004t qurilmasining tarmoq kuchlanishini va iste'mol tok qiymatini aniqlash qismlari mavjud bo'lib, bu qismlarga mos tartibda ulanadi. Tarmoq kuchlanishi va iste'mol toklar haqidagi ma'lumotlar qurilmaning ikkichi tomonidagi pinlar orqali TTL port bilan mikrokontroller yoki kompyuter qurilmasiga ulanadi (2-rasm). Katta quvvatdagi nasos elektr yuritmalarini monitoring qilishda qoshimcha o'lchov transformatorlaridan foydalaniladi [7, 9].



2-rasm. PZEM-004T qurilmasini Serial ko'rinishi.

PZEM-004T Texnik xususiyatlari va funksiyalari

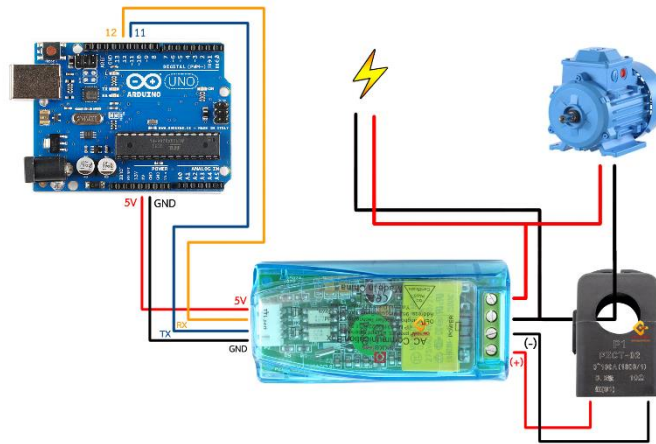
A. Xususiyatlar

- Kuchlanish o'lchovi: 80 ~ 260 V "AC"
- Quvvat o'lchovi: 0 ~ 9999 k Vt
- Tok o'lchovi: 0 ~ 100A
- Ishlash chastotasi: 45-65 Hz
- O'lchov aniqligi: 1.0

B. Funksiya

- O‘lchov funksiyasi (kuchlanish, tok kuchi, quvvat).
- Ma’lumotlarni saqlash funksiyasi
- TTL seriyali aloqa

PZEM-004t qurilmasidan olingan ma’lumotlarni mikrokontroller orqali nazorat qilsa xam bo‘ladi. Bunda qurilma mikrokontrollerga quyidagicha ulanadi va dastur yordamida nazorat qilinadi (3-rasm) [6, 8].



3-rasm. PZEM-004T qurilmasini mikrokontrollerga ulanish sxemasi.

PZEM-004T qurilmasini mikrokontroller yordamida ishga tushirish dastur kodi quyidagicha:

```

#include <SoftwareSerial.h>
SoftwareSerial pzem(11, 12);//RX, TX
void setup() {
  Serial.begin(9600);
but
  pzem.begin(9600);}
void loop() {
  float voltage = readVoltage();
but
  float current = readCurrent();
  float power = readPower();
  float energy = readEnergy();
but
  Serial.print("Voltage: ");
  Serial.print(voltage);
  Serial.println(" V");
  Serial.print("Current: ");
  return voltage / 10.0; }
  return 0.0; }
  float readCurrent() { }
    //Similar to readVoltage function
  with different command bytes
  float readPower() { }
    // Similar to readVoltage function
  with different command bytes
  float readEnergy() { }
    // Similar to readVoltage function
  with different command bytes

```

```
Serial.print(current);  
Serial.println(" A");  
Serial.print("Power: ");  
Serial.print(power);  
Serial.println(" W");  
Serial.print("Energy: ");  
Serial.print(energy);  
Serial.println(" kWh");  
delay(1000);}  
float readVoltage() {  
  pzem.write(0xB0);  
  pzem.write(0xC0);  
  pzem.write(0xA8);  
  pzem.write(0x01);  
  pzem.write(0x01);  
  pzem.write(0x00);  
  pzem.write(0x00);  
  pzem.write(0x00);  
  delay(500);  
  if (pzem.available() >= 10) {  
    byte buffer[10];  
    pzem.readBytes(buffer, 10);  
    if (buffer[0] == 0x00 && buffer[1] ==  
        0x04) {uint32_t voltage = (buffer[2] <<  
            8) + buffer[3];
```

XULOSA

Nasos qurilmasining elektr parametrlarini monitoring qilishda PZEM-004T qurilmasidan foydalanish bir necha imkoniyatlarni yaratadi, bu orqali aniqlangan ma'lumotlarni GSM yoki WiFi modullari yordamida masofadan nazoratini xam amalga oshirish mumkin. Bunda mikrokontrollerga qo'shimcha tarzda yuqoridagi modullar ulanadi. PZEM-004T qurilmasining TTL port yordamida to'g'ridan-to'g'ri kompyuterga ulanishi orqali qurilmani real vaqt mobaynida monitoring qilish imkoniyatlarini kengaytiradi, shu bilan birga real vaqt mobaynida olingan ma'lumotlar asosida nasos qurilmasining elektr yuritmasining ishlash holatini bashorat qilish xam mumkin bo'ladi.

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