DAFTAR PUSTAKA

[1] D. T. Dirta and Suyanto, “Rancang Bangun Sistem Transmisi Data Tekanan Darah untuk Mendukung Human Health Monitoring Berbasis Pada Mobile Platform Android,” *J. Tek. POMITS*, vol. 2, no. 2, pp. 189–194, 2013.

[2] S. HADIYOSO, A. ALFARUQ, Y. S. ROHMAH, and R. TULLOH, “Sistem Pengukur Tekanan Darah secara Online untuk Aplikasi Remote Monitoring Kesehatan Jantung,” *ELKOMIKA J. Tek. Energi Elektr. Tek. Telekomun. Tek. Elektron.*, vol. 7, no. 1, p. 1, 2019, doi: 10.26760/elkomika.v7i1.1.

[3] A. Zakaria, M. Subito, and A. Amir, “Sistem Monitoring Tekanan Darah Berbasis Wireless,” *Techno.Com*, vol. 18, no. 4, pp. 312–320, 2019, doi: 10.33633/tc.v18i4.2553.

[4] SHOLIHUDIN DWI PRIHATONO TANJUNG, “Tensimeter Digital Berbasis Arduino Dengan Transfer Data Berbasis Android Melalui Bluetooth,” p. 17, 2017.

[5] S. Ratna, “SISTEM MONITORING KESEHATAN BERBASIS INTERNET OF THINGS (IoT),” *Al Ulum J. Sains Dan Teknol.*, vol. 5, no. 2, p. 83, 2020, doi: 10.31602/ajst.v5i2.2913.

[6] M. B. Ulum and M. Tarigan, “Perancangan Sistem Monitoring Detak Jantung Bagi Penderita Kardiovaskular Berbasis Internet of Things,” *J. Komputasi*, vol. 8, no. 1, pp. 15–20, 2020, doi: 10.23960/komputasi.v8i1.2419.

[7] B. Mustapha, “DEVELOPMENT OF A PC INTERFACED BLOOD PRESSURE METER,” no. May, pp. 5–26, 2008.

[8] T. H. Y. Ling, J. E. H. Tan, L. J. Wong, and C. K. Lee, “Blood pressure monitoring device with zigBee (XBee) wireless protocol and microsoft visual studio computer interfacing,” *Int. J. Simul. Syst. Sci. Technol.*, vol. 16, no. 4, pp. 9.1-9.8, 2015, doi: 10.5013/IJSSST.a.16.04.09.

[9] A. I. Siam, A. Abou Elazm, N. A. El-Bahnasawy, G. El Banby, and F. E. F. E. A. E.-S. Fathi E. Abd El-Samie, "Smart Health Monitoring System based on IoT and Cloud Computing," *Menoufia J. Electron. Eng. Res.*, vol. 28, no. 1, pp. 37–42, 2019, doi: 10.21608/mjeer.2019.76711.

[10] R. Priyanka and M. Reji, "IOT based health monitoring system using blynk app," *Int. J. Eng. Adv. Technol.*, vol. 8, no. 6, pp. 78–81, 2019, doi: 10.35940/ijeat.E7467.088619.

[11] N. Hashim, N. Norddin, F. Idris, S. N. I. M. Yusoff, and M. Zahari, "IoT blood pressure monitoring system," *Indones. J. Electr. Eng. Comput. Sci.*, vol. 19, no. 3, pp. 1384–1390, 2020, doi: 10.11591/ijeecs.v19.i3.pp1384-1390.

[12] A. Sulista, Nehru, and S. Fuady, "Rancang Bangun Alat Monitoring Tekanan Darah Berbasis Internet of Things (IoT)," *J. Eng.*, vol. 3 Nomor 1, 2021.

[13] U. Mengukur, T. Darah, L. Arrazzaq, M. F. M. F. S, H. Bastanta, and I. Lamria, "Jurnal Brainstorming Pada Proses Pembuatan Tensimeter Blood Preasure TALENTA Conference Series Jurnal Brainstorming Pada Proses Pembuatan Tensimeter Blood Preasure Untuk Mengukur Tekanan Darah," vol. 3, no. 2, pp. 3–7, 2020, doi: 10.32734/ee.v3i2.1093.

[14] A. J. Puspitasari, "Rancang Bangun Blood Pressure Monitor Menggunakan Metode Osilometri Dengan Sensor Tekanan MPX5050GP," p. 103, 2015, [Online]. Available: http://repository.its.ac.id/71012/.

[15] J. Keperawatan, G. S. H. Vol, and N. Juli, "EFEKTIFITAS SENAM LANSIATERHADAP PENURUNAN TEKANAN DARAH Jurnal Keperawatan GSH Vol 9 No 2 Juli 2020 ISSN 2088-2734," vol. 9, no. 2, pp. 1–5, 2020.

[16] N. H. Zunnur, A. ADRIANTO, and E. BASYAR, "KESESUAIAN TIPE TENSIMETER AIR RAKSA DAN TENSIMETER DIGITAL TERHADAP

PENGUKURAN TEKANAN DARAH PADA USIA DEWASA," 2017.

[17] W. Aritonang, I. A. Bangsa, and R. Rahmadewin, "Implementasi Sensor Suhu DS18B20 dan Sensor Tekanan MPX5700AP menggunakan Mikrokontroller Arduino Pada Alat Pendeteksi Tingkat Stress," *J. Ilm. Wahana Pendidik.*, vol. 7, no. 1, 2021, doi: 10.5281/zenodo.4541278.

[18] F. Semiconductor and T. Data, "On-Chip Signal Conditioned , Temperature Compensated and," pp. 1–9, 2007.

[19] G. S. Miratunnisa and A. H. S. Budi, "Traffic Light Monitoring System based on NodeMCU using Internet of Things," *IOP Conf. Ser. Mater. Sci. Eng.*, vol. 384, no. 1, 2018, doi: 10.1088/1757-899X/384/1/012024.

[20] A. D. Pangestu, F. Ardianto, and B. Alfaresi, "Sistem Monitoring Beban Listrik Berbasis Arduino Nodemcu Esp8266," *J. Ampere*, vol. 4, no. 1, p. 187, 2019, doi: 10.31851/ampere.v4i1.2745.

[21] "ESP8266 NodeMCU Tutorial." https://diyi0t.com/esp8266-nodemcu-tutorial/ (accessed Nov. 04, 2021).

[22] "Arduino Uno Pinout, Specifications, Pin Configuration & Programming." https://components101.com/microcontrollers/arduino-uno (accessed Nov. 04, 2021).

[23] D. SHIFAH, "ALAT KALIBRASI TENSI METER ANEROID BERBASIS ARDUINO UNO," 2019.

[24] "Khoirul Iman: Image." https://khoiruliman.files.wordpress.com/2016/06/0000146_blue-backlight-2004a-lcd-module-i2c-interface.jpeg?w=718 (accessed Nov. 04, 2021).

[25] "Pengertian Motor DC dan Prinsip Kerjanya - Teknik Elektronika." https://teknikelektronika.com/pengertian-motor-dc-prinsip-kerja-dc-motor/

(accessed Nov. 04, 2021).

[26] N. SYAHRINA, "PERANCANGAN SISTEM DETEKSI DAN PENGUNCI KATUB TABUNG GAS PENCEGAH KEBOCORAN BERBASIS MIKROKONTROLER ATMEGA 8," 2017.

[27] "Sphygmomanometer Vent valve DC 6V 60MA 0.36W normally open type DC exhaust valve for instruments or Massage equipment|Valve| - AliExpress." https://www.aliexpress.com/item/32971316704.html (accessed Nov. 04, 2021).

[28] A. Satriady, W. Alamsyah, H. I. Saad, and S. Hidayat, "PENGARUH LUAS ELEKTRODA TERHADAP KARAKTERISTIK BATERAI LiFePO 4," *J. Mater. dan Energi Indones.*, vol. 06, no. 02, pp. 43–48, 2016.

[29] W. Yantoro, Dwi, "ANALISIS EFISIENSI PENGGUNAAN BATERAI LITHIUM POLYMER 48 V 25 Ah PADA SEPEDA MOTOR LISTRIK YANG DI RANCANG BANGUN DENGAN DAYA 3 KW," 2019, [Online]. Available: https://library.usu.ac.id.

[30] D. E. Savitri, "Gelang Pengukur Detak Jantung dan Suhu Tubuh Manusia Berbasis Internet of Things (IoT)," pp. 1–87, 2020.

[31] J. Arifin, L. N. Zulita, and Hermawansyah, "Perancangan Murottal Otomatis Menggunakan Mikrokontroller Arduino Mega 2560," *J. Media Infotama*, vol. 12, no. 1, pp. 89–98, 2016, [Online]. Available: https://jurnal.unived.ac.id/index.php/jmi/article/view/276/257.

[32] F. MANURUNG, "RANCANG BANGUN ALAT DETEKSI BANJIR MENGGUNAKAN IoT (BLYNK) BERBASIS ARDUINO UNO," pp. 7–37, 2020.

[33] S. Bakri and R. Rachmawarni Bachtiar, "Buku Panduan Pendidikan Keterampilan Klinik 1 Keterampilan Pengukuran Tanda-tanda Vital," 2014.

[34] "Korotkoff sounds: what do we know about its discovery? : Journal of Hypertension." https://journals.lww.com/jhypertension/fulltext/2005/01000/korotkoff_sounds___what_do_we_know_about_its.2.aspx#JCL0-4 (accessed Dec. 27, 2021).

[35] P. Burstyn, B. O'donovan, and I. Charlton, "Blood pressure variability: The effects of repeated measurement," *Postgrad. Med. J.*, vol. 57, no. 670, pp. 488–491, 1981, doi: 10.1136/pgmj.57.670.488.

[36] E. Kanine and S. Paputungan, "Pengaruh Pengukuran Tekanan Darah Terhadap Perubahan Ansietas Pada Klien Hipertensi Di Desa Kobo Kecil Kotamobagu Timur," *J. Keperawatan*, vol. 6, no. 2, 2018.

[37] Y. H. Hendrayana and M. A. Riyadi, "Rancang Bangun Alat Pengukur Tekanan Darah Otomatis Menggunakan Metode Oscillometry Berbasis Raspberry Pi Model B," *Transmisi*, vol. 18, no. 1, pp. 38–42, 2016, doi: 10.12777/transmisi.18.1.38-42.

LAMPIRAN

Lampiran A data pengujian

Gambar A.1 Datasheet Sensor Tekanan MPX5700AP

Table 1. Maximum Ratings[1]

Parametrics	Symbol	Value	Unit
Maximum Pressure[2] (P2 ≤ 1 Atmosphere)	$P1_{max}$	2800	kPa
Storage Temperature	T_{stg}	–40 to +125	°C
Operating Temperature	T_A	–40 to +125	°C

1. Maximum Ratings apply to Case 867 only. Extended exposure at the specified limits may cause permanent damage or degradation to the device.
2. This sensor is designed for applications where P1 is always greater than, or equal to P2. P2 maximum is 500 kPa.

Table 2. Operating Characteristics (V_S = 5.0 Vdc, T_A = 25°C unless otherwise noted, P1 > P2. Decoupling circuit shown in Figure 4 required to meet electrical specifications.)

Characteristic		Symbol	Min	Typ	Max	Unit
Pressure Range[1]	Gauge, Differential: MPX5700D Absolute: MPX5700A	P_{OP}	0 15	— —	700 700	kPa
Supply Voltage[2]		V_S	4.75	5.0	5.25	Vdc
Supply Current		I_O	—	7.0	10	mAdc
Zero Pressure Offset[3]	Gauge, Differential (0 to 85°C) Absolute (0 to 85°C)	V_{off}	0.088 0.184	0.2 —	0.313 0.409	Vdc
Full Scale Output[4]	(0 to 85°C)	V_{FSO}	4.587	4.7	4.813	Vdc
Full Scale Span[5]	(0 to 85°C)	V_{FSS}	—	4.5	—	Vdc
Accuracy[6]	(0 to 85°C)	—	—	—	±2.5	$\%V_{FSS}$
Sensitivity		V/P	—	6.4	—	mV/kPa
Response Time[7]		t_R	—	1.0	—	ms
Output Source Current at Full Scale Output		I_{O+}	—	0.1	—	mAdc
Warm-Up Time[8]		—	—	20	—	ms

1. 1.0 kPa (kiloPascal) equals 0.145 psi.
2. Device is ratiometric within this specified excitation range.
3. Offset (V_{off}) is defined as the output voltage at the minimum rated pressure.
4. Full Scale Output (V_{FSO}) is defined as the output voltage at the maximum or full rated pressure.
5. Full Scale Span (V_{FSS}) is defined as the algebraic difference between the output voltage at full rated pressure and the output voltage at the minimum rated pressure.
6. Accuracy (error budget) consists of the following:
   - Linearity: Output deviation from a straight line relationship with pressure over the specified pressure range.
   - Temperature Hysteresis: Output deviation at any temperature within the operating temperature range, after the temperature is cycled to and from the minimum or maximum operating temperature points, with zero differential pressure applied.
   - Pressure Hysteresis: Output deviation at any pressure within the specified range, when this pressure is cycled to and from the minimum or maximum rated pressure, at 25°C.
   - TcSpan: Output deviation over the temperature range of 0° to 85°C, relative to 25°C.
   - TcOffset: Output deviation with minimum rated pressure applied, over the temperature range of 0° to 85°C, relative to 25°C.
   - Variation from Nominal: The variation from nominal values, for Offset or Full Scale Span, as a percent of V_{FSS}, at 25°C.
7. Response Time is defined as the time for the incremental change in the output to go from 10% to 90% of its final value when subjected to a specified step change in pressure.
8. Warm-up Time is defined as the time required for the device to meet the specified output voltage after the pressure has been stabilized.

Table 3. Mechanical Characteristics

Characteristics	Typ	Unit
Weight, Basic Element (Case 867)	4.0	grams

ON-CHIP TEMPERATURE COMPENSATION, CALIBRATION AND SIGNAL CONDITIONING

Figure 3 illustrates both the Differential/Gauge and the Absolute Sensing Chip in the basic chip carrier (Case 867). A fluorosilicone gel isolates the die surface and wire bonds from the environment, while allowing the pressure signal to be transmitted to the sensor diaphragm. (For use of the MPX5700D in a high-pressure cyclic application, consult the factory.)

The MPX5700 series pressure sensor operating characteristics, and internal reliability and qualification tests are based on use of dry air as the pressure media. Media, other than dry air, may have adverse effects on sensor performance and long-term reliability. Contact the factory for information regarding media compatibility in your application.

Figure 2 shows the sensor output signal relative to pressure input. Typical, minimum, and maximum output curves are shown for operation over a temperature range of 0° to 85°C using the decoupling circuit shown in Figure 4. The output will saturate outside of the specified pressure range.

Figure 4 shows the recommended decoupling circuit for interfacing the output of the integrated sensor to the A/D input of a microprocessor or microcontroller. Proper decoupling of the power supply is recommended.

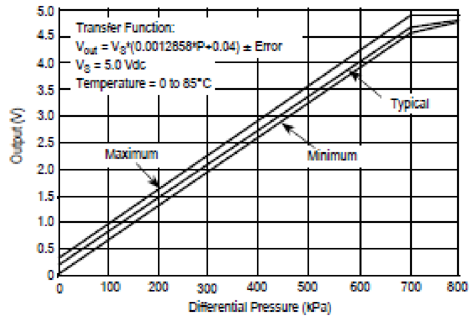


Figure 2. Output versus Pressure Differential

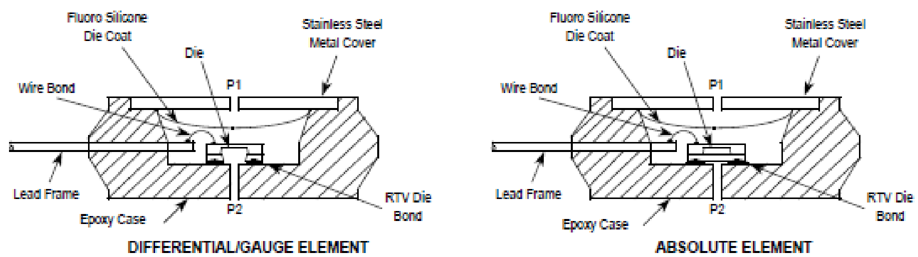


Figure 3. Cross-Sectional Diagrams (not to scale)

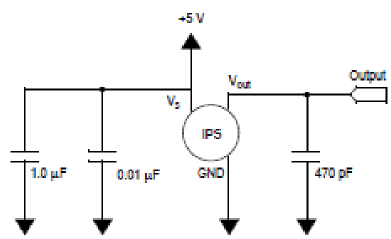


Figure 4. Recommended Power Supply Decoupling and Output Filtering
(For additional output filtering, please refer to Application Note AN1646)

Tabel A.1 Data hubungan tekanan dan tegangan sensor MPX5700AP

tekanan (mmhg)	Data Adc	Tegangan keluaran (mV)
0	284	833
10	289	844
20	291	852
30	293	860
40	296	868
50	300	879
60	302	886
70	305	896
80	307	902
90	309	913
100	313	922
110	316	929
120	319	938
130	321	947
140	324	957
150	327	965
160	329	973

Tabel A.2 Data kalibrasi sensor tekanan

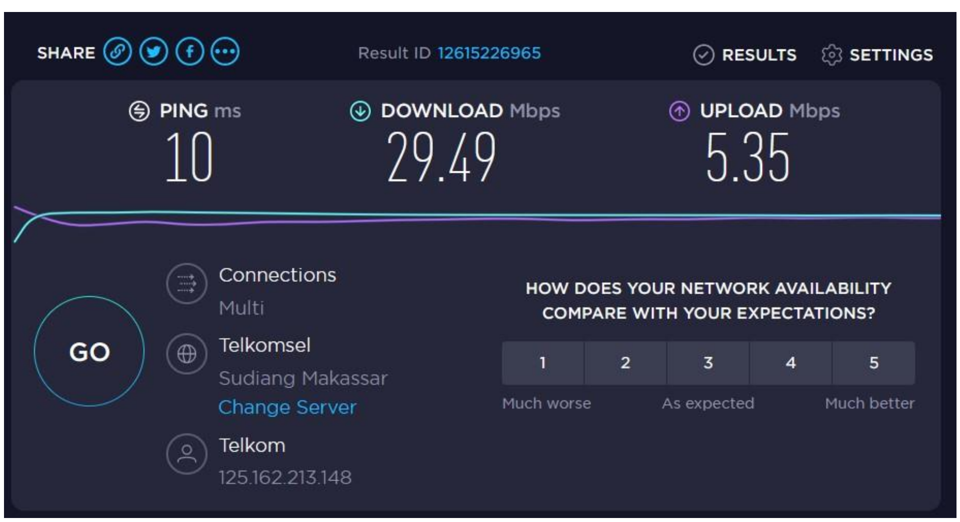
Vout multimeter (mV)	tekanan mmhg tensi aneroid	Data Adc	Vout pada program (mV)	Tekanan (mmhg) pada program
833	0	284	834	0
844	10	289	849	17
852	20	291	854	24
860	30	293	860	31
868	40	296	869	41
879	50	300	881	55
886	60	302	887	62
896	70	305	895	72
902	80	307	901	79

913	90	309	907	86
922	100	313	919	99
929	110	316	928	110
938	120	319	937	120
947	130	321	942	127
957	140	324	951	137
965	150	327	960	147
973	160	329	966	154

Tabel A.3 Pengujian pada pasien dengan tekanan darah rendah dan tinggi

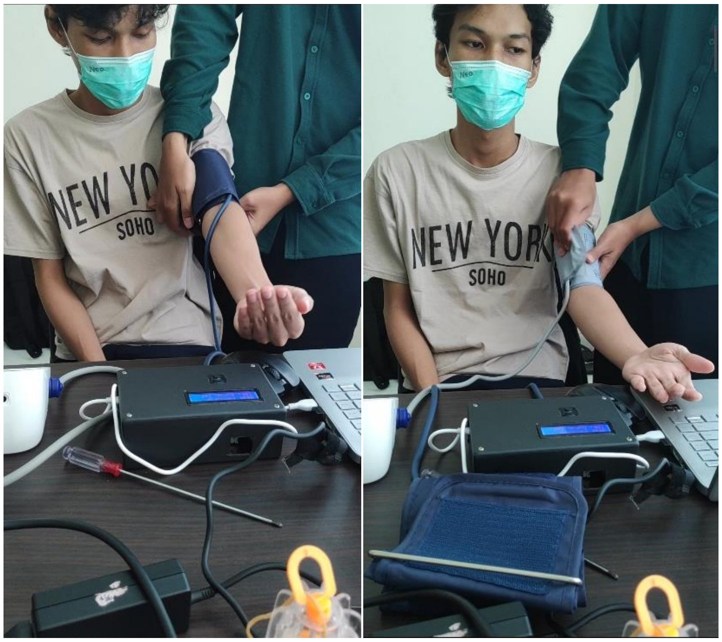
No.	Usia	Jenis Kelamin	Alat Rancangan (mmhg)		Omron HEM-8712				Error (%)		Ket.
					Pengukuran I (mmhg)		Pengukuran II (mmhg)				
			Sys	Dia	Sys	Dia	Sys	Dia	Sys	Dia	
1	28	P	95	62	98	65	96	60	1,04	3,33	Rendah
2	22	L	105	68	106	68	107	70	0,94	0,00	Rendah
3	58	P	145	92	146	92	148	95	0,68	0,00	Tinggi
4	54	P	138	90	140	90	142	88	1,43	2,27	Tinggi

Gambar A.2 Data hasil speed test wifi



Lampiran B Dokumentasi Penelitian

Gambar B.1 Dokumentasi Pengujian Sensor Tekanan MPX5700AP



Gambar B.2 Dokumentasi pengambilan data(1)

Gambar B.3 Dokumentasi pengambilan data(2)

Gambar B.4 Dokumentasi Pengambilan data(3)

Lampiran C Kode program ESP8266

- Kode program pengujian sensor tekanan

```
#include <Wire.h>
#include <SPI.h>
#include <LiquidCrystal_I2C.h>

LiquidCrystal_I2C lcd(0x27, 16,2);

int motor = D6;
int Datasensor;
float Vout;
int mmhg;
float kpa;
int tombol = D5;
int tombolx;
int hitung;

void setup() {
  lcd.begin();
  lcd.backlight();
  Serial.begin(115200);
  pinMode(motor,OUTPUT);
  pinMode(tombol,INPUT_PULLUP);
}…
```

- Kode Program Pengukuran Tekanan Darah

```
#define BLYNK_DEVICE_NAME    "Blood Pressure"
#define BLYNK_AUTH_TOKEN     "eyWrlypsBqiLd0PW9baIQpB3mbjKFibX"
#define BLYNK_DEFAULT_PORT 8080
#include <Wire.h>
#include <SPI.h>
#include <LiquidCrystal_I2C.h>
#define  BLYNK_PRINT Serial
#include <ESP8266WiFi.h>
#include <BlynkSimpleEsp8266.h>
```

```
LiquidCrystal_I2C lcd(0x27, 16, 2);

char auth[] = "eyWrlypsBqiLd0PW9baIQpB3mbjKFibX";
char ssid[] = "White House";
char pass[] = "NMA@949599";

int motor = D6;
int solenoid = D7;
int Datasensor;
float Vout;
float kpa;
int tombol = D5;
float mmhg;
float mmhgx;
int sistole;
int diastole;
int sistolex;
int diastolex;
int mark = 0;

void sendSensor ()
{
  Blynk.virtualWrite(V0, sistolex);
  Blynk.virtualWrite(V1, diastolex);
  delay(1000);
}

void setup() {
  lcd.clear();
  lcd.begin();
  lcd.backlight();
  lcd.noCursor();
  Wire.begin();
  pinMode(motor, OUTPUT);
  pinMode(solenoid, OUTPUT);
  pinMode(tombol, INPUT_PULLUP);
  Serial.begin(115200);
  Blynk.begin(auth, ssid, pass,"blynk-cloud.com",8080);

  lcd.setCursor(0,0);
  lcd.print("Alat Pengukur ");
  lcd.setCursor(0,1);
```

```
  lcd.print("Tek. Darah IoT");

}

void loop() {

  Blynk.run();
  Datasensor = analogRead(A0);
  Vout = ((Datasensor) * 0.002936 );
  kpa = ((Vout / 5.0) - 0.04)  / 0.0012858;
  mmhgx = (kpa * 7.50061) - 739.47;

  if (!digitalRead(tombol)) {
    mark = 0;
    lcd.clear();
    delay(1000);
    digitalWrite(motor, HIGH);
    digitalWrite(solenoid, HIGH);
    mulai();

  }
}…
```