Turnitin Originality Report

Processed on: 31-May-2021 20:42 WIB
ID: 1597838293
Word Count: 3063
Submitted: 1

Similarity Index	Similarity by Source
19%	Internet Sources: 14% Publications: 18% Student Papers: 2%

Design a Low-Cost Digital Pressure Meter Equipped with Temperature and Humidity Parameters By Dewa Gede

5% match (publications)
Gede Aditya Mahendra Oka, Andjar Pudji. "Design of Vital Sign Monitor with ECG, BPM, and Respiration Rate Parameters", Indonesian Journal of electronics, electromedical engineering, and medical informatics, 2021

4% match (publications)
Nikmatul Jannah, Syaifudin Syaifudin, Liliek Soetjiatie, Muhammad Irfan Ali. "Simple and Low Cost Design of Infusion Device Analyzer Based on Arduino", Indonesian Journal of electronics, electromedical engineering, and medical informatics, 2020

3% match (publications)
Ketut Dyah Kusumadewi, Syaifudin Syaifudin, Tri Bowo Indrato. "DPM Dua Mode Dilengkapi Thermohygrometer dan Pemilihan Tekanan (Positive Pressure)", Jurnal Teknokes, 2020

1% match ()
Padang Tunggal, Tatiya, Sanjaya, Alfana, Agus Widodo, Hendro, Kunal, Kunal, Thanh Nguyen, Phong. "Gas Pressure Measurement Device and Medical Vacuum Design", Journal of Robotics and Control (JRC), 2020

1% match (publications)
Yanti Kusumawardani, Endang Dian Setioningsih, Dyah Titisari. "Water Bath Calibration Device with Data Storage Using Six Thermocouple Sensor", Journal of Electronics, Electromedical Engineering, and Medical Informatics, 2020

1% match (publications)
Fita Florensa Rooswita, Triana Rahmawati, Syaifudin Syaifudin. "A Two-Mode Digital Pressure Meter Equipped With An Automatic Leak Test Using MPX5050gp And MPXv4115vc6u Sensors", Journal of Electronics, Electromedical Engineering, and Medical Informatics, 2020

1% match (publications)
I KOMANG YOGI MAHARDIKA, Bambang Guruh Irianto, Torib Hamzah, Shubhrojit Misra. "Central Monitor Based on Personal Computer Design with SpO2 and Body Temperature Parameters Using Wireless Xbee Pro", Journal of Electronics, Electromedical Engineering, and Medical Informatics, 2021

1% match (student papers from 02-Dec-2014)
Submitted to University of Alabama, Huntsville on 2014-12-02

1% match (Internet from 10-Dec-2020)
https://randomnerdtutorials.com/nextion-display-with-arduino-getting-started/

1% match (publications)

Rizki Aulia Rachman, I Dewa Gede Hari Wisana, Priyambada Cahya Nugraha. "Development of a Low-Cost and Effisient ECG devices with IIR Digital Filter Design", Indonesian Journal of electronics, electromedical engineering, and medical informatics, 2021

1% match ()

Chin, Wei. "The factors determining office investment markets in South-East Asian cities : with reference to Hong Kong, Singapore, Taipei, Bangkok and Kuala Lumpur", Oxford Brookes University, 2003

Indonesian Journal of Electronics, Electromedical, and Medical Informatics (IJEEEMI) Vol. 3, No. 2, May 2021, pp. 59-64 DOI: 10. 35882/ijeeemi .v3i2.4 ISSN: 2656-8624 Design a Low-Cost Digital Pressure Meter Equipped with Temperature and Humidity Parameters Bedjo Utomo1, I Dewa Gede Hariwisana1, Shubhrojit Misra2 1Departemen Electromedical Teknik Poltekkes Kemenkes, Surabaya, Indonesia Jl. Pucang Jajar Timur No. 10, Surabaya, 60245, Indonesia 2Department of Electronics and Telecommunication Engineering, Jadavpur University 188, Raja S.C. Mallick Rd, Kolkata, West Bengal 700032, India Article Information Abstrak Article History: Calibration is a technical activity which consists of determining one or more properties and Received: April 5, 2021 characteristics of a product, process or service according to a predetermined special procedure. The Revision: April 15,2021 purpose of calibration is to ensure measurement results comply with national and international Accepted: May 10, 2021 standards. The purpose of this study is to design two mode digital pressure meter (DPM) device equipped with a thermo-hygrometer and pressure in which the design is completed with a selection Keyword: mode to determine the positive and negative pressure (vacuum) using MPX 5050GP sensor as a positive Calibration pressure sensor. In this design DHT 22 sensors is used to measure the humidity and temperature. To Pressure meter test the leak test this device is also equipped with timer. This design uses a 2.4 inch Nextion TFT LCD screen to display data. Data analysis was performed by comparing modul with standard tools. In the Sphygmomanometer measurement process, Mercury tensimeter was carried out 6 times the data and the smallest results Humidity were 0 mmHg on the module and 0 mmHg on the standard tool and the largest was 298.0 mmHg on the module and 300 mmHg on the standard tool. Data were collected in a room with a temperature of 31Č and humidity of 87%. Finally, this design is applicable for daily used for electromedical engineer to calibrate the sphygmomanometer in the hospitals. Corresponding author: bedjoutomo123@gmail.com Departemen Electromedical Teknik PoltekkesKemenkes, Surabaya Jl. Pucang Jajar Timur No. 10, Surabaya, 60245, Indonesia This work is an open access article and licensed under a Creative Commons Attribution-ShareAlike 4.0 International License(CC BY-SA 4.0). I. INTRODUCTION Digital Pressure Meter (DPM) is a tool used to measure positive and negative pressure on medical devices in liquid or gas form to assist in quality improvement and control. The way this tool works is by converting the value of the pressure sensor to be changed and displayed on the display. There are many forms, types, and functions of Digital Pressure Meter, such as those that serve only as inflatable pressure and suction pressure. In this study, the use of DPM related to calibration on mercury tensimeters and suction pumps. Tensimeter is a tool to measure blood pressure that is often used in the medical world, its function is vital because it becomes the basis for doctors to diagnose patient health.[1] Accurate blood pressure measurement requires the use of an accurate sphygmomanometer. The accuracy of the sphygmomanometer relies heavily on performing the correct maintenance and calibration process of this equipment. One of the most common errors in blood pressure measurement is caused by the use of an uncalibrated sphygmomanometer and improper use of cuffs.

Inaccurate maintenance and calibration of sphygmomanometers is the cause of systematic errors in blood pressure measurement. Tensimeter is a tool that has a low and high risk, judging by its use tensimeter is a tool that is often used continuously so that the risk of a decrease in tool performance is very high let alone never done good maintenance. frequent damage that is at the level of leakage. Several measuring instruments tensimeters and suction pumps have been made electromedical engineering students titled DPM Two Modes Equipped With Temperature And Humidity Portable Based Arduino Nano. [2] On the tool is made 2 modes of waiting for temperature and humidity by displayed on the character LCD. Furthermore, in 2017 N H Zunnur analyzed the suitability of mercury and digital tensimeter types to blood pressure measurements in adulthood in the analysis stated that the difference between the two tensimeters was indicated by good conformity tests, namely systolic pressure (Kappa Value=0.782) and Distolic pressure (Kappa value=0.565) [3]. In 2017 by Junia Dyah Permata Wibisono made the final task with the title Digital Pressure Accredited by Ministry of Research and Technology /National Research and Innovation Agency, Indonesia Decree No: 200/M/KPT/2020 Journal homepage: http://ijeeemi.poltekkesdepkes-sby.ac.id/index.php/ijeeemi 59 Indonesian Journal of Electronics, Electromedical, and Medical Informatics (IJEEEMI) Vol. 3, No. 2, May 2021, pp. 59-64 DOI: 10. 35882/ijeeemi.v3i2.4 ISSN: 2656-8624 Humidity & Temperature Sensor DHT22 Arduino NANO LCD TPT Display Nextion MPX Sensor 5050 GP Design Three ways Bulb Device under test Manset Fig. 1 The diagram block of the system Meter (DPM) Vacum Pressure with lcd display characters. In this tool only use 1 (one) mode that is used only for suction pump [3] and In 2018 Yosep Kurniawan made the final task of Digital Pressure Meter (DPM) two modes namely positive pressure and suction pressure but this tool is still relatively standard accuracy level that has a correction value of 0 - 3mmHg [4]. Furthermore, in 2019 Mukhamad Ryan Nur Rohman in a study on the design entitled Digital Pressure Meter (DPM) Tensimeter and Suction Pump, but this tool still has a deficiency in the measurement of the rate of leakage tensimeter is not equipped with the temperature and humidity of the room, this is very important because the temperature, and humidity of the room can affect the results at the time of measurement. [4] Calibration environmental conditions should be adjusted according to the requirements of calibration methods such as temperature and humidity. [5] Not always calibration should be done in a tightly conditioned room. Calibration environmental conditioning is usually done for calibration of volatile equipment due to the influence of temperature, humidity, vibration, light, and so on. [6]. II. MATERIALS AND METHODS A. Research Design This study used measurements against mercury tensimeters with positive pressure settings; 0mmHg, 50mmHg, 100mmHg, 150mmHg, 200mmHg, 250mmHg, 300mmHg, which can then be converted to kPa. Data retrieval repeated 6 times. [7] 1) Materials This study used the MPX 5050GP Sensor by Freescale Semiconductor to serve as an inflatable pressure. And the DHT22 Aosong Electronics Co.,Ltd sensor serves as a temperature, humidity sensor. Output sensor MPX 5050 GP then go to the input buffer circuit. The output of the buffer circuit then VCC, output and GND from the DHT 22 sensor legs then enter and be processed into the Arduino Nano. Arduino Nano as controller and controller. Arduino Nano output in the form of a display on the 2.4 inch TFT Nextion LCD[8][6]. 2) Experiments In this study, after the finished design, digital pressure meter (Positive Pressure) output testing was conducted with pressures of 0 mmHg, 50 mmHg, 100 mmHg, 150 mmHg, 200 mmHg, Accredited by Ministry of Research and Technology /National Research and Innovation Agency, Indonesia Decree No: 200/M/KPT/2020 Journal homepage: http://ijeeemi.poltekkesdepkes-sby.ac.id/index.php/ijeeemi 60 Indonesian Journal of Electronics, Electromedical, and Medical Informatics (IJEEEMI) Vol. 3, No. 2, May

2021, pp. 59-64 DOI: 10. 35882/ijeeemi.v3i2.4 ISSN: 2656-8624 250 mmHg, 300 mmHg, and measurements with the Tensimeter. Each setting, calculated to validate the results of this study. B. Block Diagram In this study, Positive data was obtained from cuff hoses and pump hoses from Tensimeters with several pressures namely 0 mmHg, 50 mmHg, 100 mmHg, 150 mmHg, 200 mmHg, 250 mmHg, 300 mmHg, shown in Figure. 1. MPX 5050 GP sensor as inflatable pressure. The sensor output then enters the buffer circuit input as a current amplifier without voltage amplifier occurring. The output buffer is then entered and processed into Arduino Nano. There is a conversion from mmHg to kPa to be processed to Arduino Nano as well. After processing using Arduino Nano, the output is a display on the 2.4 inch TFT Nextion LCD. [9] In Fig.1 Blog Diagrams it is explained that in the calibration process, the cuff hose and pump hose of the tensimeters used for calibration testing materials. MPX 5050 GP sensor as an inflatable pressure sensor. Output sensor further into the DHT 22 sensor as a humidity temperature sensor, VCC, output and ground are connected to the Arduino nano pin.[10] [11] then conduct a test for 60 seconds that serves as a time to perform a leak test when performing measurements on the tensimeter. Furthermore, the data displayed on the 2.4- inch TFT Nextion LCD serves as a display to display the measurement, calibration process. On the Digital Pressure Meter tool system, the LCD displays the result of pressure and conversion. C. Flowchart Start Initialization Temperature and Humidity Calibration? Measure the Pressure Display Pressure Leak test Start Timer Measure the Pressure Display Leak End Fig. 2 The system flowchart In figure 2 flow diagram starts when the module starts then there is initialization, there is the appearance of temperature, humidity, there are two modes of selection, namely positive mode and vacuum, when choosing a positive mode when doing manual pumping then the MPX 5050 GP sensor will read and the results will be displayed in positive mode measurement there is a 60-second timer for leak test. From the reading can be converted again pressure unit from mmHg to kPa and then the data is displayed on the LCD TFT Nextion 2.4 inch. III. RESULTS In this study, Digital Pressure Meter Module has been measured with Mercury Tensimeter tool Fig.3 Pengukuran pada tensimeter In fiq.3 The Digital Pressure Meter module contains each connector of the maximum pressure sensor output of the vacuum pressure of -400 mmHg 1) Digital Pressure Meter Module Design Display used using LCD TFT Nextion fiq. 4 Fig. 4. Digital Pressure Display Accredited by Ministry of Research and Technology /National Research and Innovation Agency, Indonesia Decree No: 200/M/KPT/2020 Journal homepage: http://ijeeemi.poltekkesdepkes-sby.ac.id/index.php/ijeeemi 61 Indonesian Journal of Electronics, Electromedical, and Medical Informatics (IJEEEMI) Vol. 3, No. 2, May 2021, pp. 59-64 DOI: 10. 35882/ijeeemi.v3i2.4 ISSN: 2656-8624 Algorithm 1: Reading the Pressure TABLE II. ANOVA PARAMETER FOR SIGNIFICANT DIFFERENCE BETWEEN MEASUREMENT void loop(void) BEGIN Source of Variation SS MS F P-value F crit delay(50); Between sensorValue = analogRead(sensorPin); Groups 4,5714 2,28571 0,00019 0,9998 3,555 Vout = (sensorValue *5.0/1023.0)*1000; Within Value_Kpa= (Vout-165.29)/90; Groups 206556 11475,3 Value_mmHg = (Value_Kpa*7.5); Total 206561 static char tekananPositif[6]; In table 1 the results of the analysis showed no influence dtostrf(Value_mmHg, 3, 1, tekananPositif); (p=0.999) on measurements made for 3 x. Meanwhile, the t9.setText(tekananPositif); measurements in the module are carried out from 0 mmHg to delay(50); 300 mmHg can be seen in table II. END TABLE III THE VARIANCE CALCULATION AMONG MEASUREMENT Algoritme2: Humidity Temperature void bupdatePopCallback(void *ptr) Groups Count Sum Average Variance BEGIN Down 1 7 1036 148 11452,7 float h = dht.readHumidity(); float t = dht.readTemperature(); Down 2 7 1033 147,571 11518 IF (isnan(h) || isnan(t) ||) Down 3 7 1033 147,571 11585,3 THEN return; TABLE IV. ANOVA PARAMETER FOR SIGNIFICANT static char temperatureCTemp[6];

DIFFERENCE BETWEEN MEASUREMENT BEGIN dtostrf(t, 6, 2, temperatureCTemp); Source of tTempC.setText(temperatureCTemp); Variation SS F P-value F crit char hTemp[10] = {0}; Between utoa(int(h), hTemp, 10); Groups 0,8571 3,72E-05 0,99996 3,55 tHumidity.setText(hTemp); Within END Groups 207335 Total 207336 3) Measurement on Mercury Tensimeter Pressure measurements in the module range from 0 mmHg to In table II the analysis showed no influence (p=0.999) as 300 mmHg with the pressure measurement range rising per 50 long as the measurements performed on the measurements mmHg performed for 3 x measurements. The results of the dropped on the module from 0 mmHg to 300 mmHg. analysis can be seen in the table below. TABLE I. ANOVA SINGLE FACTOR IN MEASUREMENT OF INCREASING MODE Groups Increase 1 Increase 2 Increase 3 Count Sum 7 1038 7 1042 7 1046 Average 148,29 148,86 149,43 Variance 11504,9 11386,5 11534,6 Accredited by Ministry of Research and Technology /National Research and Innovation Agency, Indonesia Decree No: 200/M/KPT/2020 Journal homepage: http://ijeeemi.poltekkesdepkes-sby.ac.id/index.php/ijeeemi 62 Indonesian Journal of Electronics, Electromedical, and Medical Informatics (IJEEEMI) Vol. 3, No. 2, May 2021, pp. 59-64 DOI: 10. 35882/ijeeemi.v3i2.4 ISSN: 2656-8624 Blue=standard, Red=mmHg, Green=kPa 700 Pressure (mmHg, or kPa) 600 500 400 300 200 129.86 100 64.48 100 0 0 50 2260.81 12500 200 150 39.3 295 33.1 248 300 250 1 2 3 4 5 6 7 Number of Measurement Fig. 8. Convert mmHg Value to Kpa at Up Position 700 39.3 600 33.1 Pressure (mmHg, kPa) 500 26.5 400 19.8 300 300 13.6 250 200 200 150 6.5 100 100 50 0 0 1 2 3 4 5 Number of Measurement 6 7 Meansurement Value Value mmHg Value Kpa Fig. 9. Conversion of mmHg Value to Kpa at down position Data retrieval in this module is done with a standard mercury tensimeter and this measurement is done for 6 measurements. IV. DISCUSSION Positive pressure measurement of 0-300mmHg with a 50mmHg point increase obtained a reduction difference of - 3.3> 0 <3.3 with an average error factor of 2=0.39. In negative pressure measurements of 0-300 mmHg with a decrease of 50mmHg the difference of -3.7> 0 <3.7 with an error factor of rata2= 0.26, this meets calibration standards for uncertainty factors in measurement errors of 0.8. Measurement of this module is done by retrieving data on the mercury tensimeter tool 6 times. Thus, the results of the design is not much different frDigital Pressure Meter Equipped with Temperature and Humidity Parameters Bedjo Utomo1, I Dewa Gede Hariwisana1, Shubhrojit Misra2 1Departemen Electromedical Teknik Poltekkes Kemenkes, Surabaya, Indonesia Jl. Pucang Jajar Timur No. 10, Surabaya, 60245, Indonesia 2Department of Electronics and Telecommunication Engineering, Jadavpur University 188, Raja S.C. Mallick Rd, Kolkata, West Bengal 700032, India Article Information Abstrak Article History: Calibration is a technical activity which consists of determining one or more properties and Received: April 5, 2021 characteristics of a product, process or service according to a predetermined special procedure. The Revision: April 15,2021 purpose of calibration is to ensure measurement results comply with national and international Accepted: May 10, 2021 standards. The purpose of this study is to design two mode digital pressure meter (DPM) device equipped with a thermo-hygrometer and pressure in which the design is completed with a selection Keyword: mode to determine the positive and negative pressure (vacuum) using MPX 5050GP sensor as a positive Calibration pressure sensor. In this design DHT 22 sensors is used to measure the humidity and temperature. To Pressure meter test the leak test this device is also equipped with timer. This design uses a 2.4 inch Nextion TFT LCD screen to display data. Data analysis was performed by comparing modul with standard tools. In the Sphygmomanometer measurement process, Mercury tensimeter was carried out 6 times the data and the smallest results Humidity were 0 mmHg on the module and 0 mmHg on the standard tool and the largest was 298.0 mmHg on the module and 300 mmHg on the standard tool. Data were collected in a room with a temperature of 31Ċ and humidity of 87%. Finally, this design is applicable for daily used for electromedical engineer to calibrate the sphygmomanometer in the hospitals. Corresponding author: bedjoutomo123@gmail.com Departemen Electromedical Teknik PoltekkesKemenkes, Surabaya Jl. Pucang Jajar Timur No. 10, Surabaya, 60245, Indonesia I. INTRODUCTION Digital Pressure Meter (DPM) is a tool used to measure positive and negative pressure on medical devices in liquid or gas form to assist in quality improvement and control. The way this tool works is by converting the value of the pressure sensor to be changed and displayed on the display. There are many forms, types, and functions of Digital Pressure Meter, such as those that serve only as inflatable pressure and suction pressure. In this study, the use of DPM related to calibration on mercury tensimeters and suction pumps. Tensimeter is a tool to measure blood pressure that is often used in the medical world, its function is vital because it becomes the basis for doctors to diagnose patient health.[1] Accurate blood pressure measurement requires the use of an accurate sphygmomanometer. The accuracy of the sphygmomanometer relies heavily on performing the correct maintenance and calibration process of this equipment. One of the most common errors in blood pressure measurement is caused by the use of an uncalibrated sphygmomanometer and improper use of cuffs. Inaccurate maintenance and calibration of sphygmomanometers is the cause of systematic errors in blood pressure measurement. Tensimeter is a tool that has a low and high risk, judging by its use tensimeter is a tool that is often used continuously so that the risk of a decrease in tool performance is very high let alone never done good maintenance. frequent damage that is at the level of leakage. Several measuring instruments tensimeters and suction pumps have been made electromedical engineering students titled DPM Two Modes Equipped With Temperature And Humidity Portable Based Arduino Nano. [2] On the tool is made 2 modes of waiting for temperature and humidity by displayed on the character LCD. Furthermore, in 2017 N H Zunnur analyzed the suitability of mercury and digital tensimeter types to blood pressure measurements in adulthood in the analysis stated that the difference between the two tensimeters was indicated by good conformity tests, namely systolic pressure (Kappa Value=0.782) and Distolic pressure (Kappa value=0.565) [3]. In 2017 by Junia Dyah Permata Wibisono made the final task with the title Digital Pressure Accredited by Ministry of Research and Technology /National Research and Innovation Agency, Indonesia Decree No: 200/M/KPT/2020 Journal homepage: http://ijeeemi.poltekkesdepkes-sby.ac.id/index.php/ijeeemi 59 Indonesian Journal of Electronics, Electromedical, and Medical Informatics (IJEEEMI) Vol. 3, No. 2, May 2021, pp. 59-64 DOI: 10. 35882/ijeeemi.v3i2.4 ISSN: 2656-8624 Humidity & Temperature Sensor DHT22 Arduino NANO LCD TPT Display Nextion MPX Sensor 5050 GP Design Three ways Bulb Device under test Manset Fig. 1 The diagram block of the system Meter (DPM) Vacum Pressure with lcd display characters. In this tool only use 1 (one) mode that is used only for suction pump [3] and In 2018 Yosep Kurniawan made the final task of Digital Pressure Meter (DPM) two modes namely positive pressure and suction pressure but this tool is still relatively standard accuracy level that has a correction value of 0 - 3mmHg [4]. Furthermore, in 2019 Mukhamad Ryan Nur Rohman in a study on the design entitled Digital Pressure Meter (DPM) Tensimeter and Suction Pump, but this tool still has a deficiency in the measurement of the rate of leakage tensimeter is not equipped with the temperature and humidity of the room, this is very important because the temperature, and humidity of the room can affect the results at the time of measurement. [4] Calibration environmental conditions should be adjusted according to the requirements of calibration methods such as temperature and humidity. [5] Not always calibration should be done in a tightly conditioned room. Calibration environmental conditioning is usually done for calibration of volatile equipment due to the influence of temperature, humidity, vibration, light, and so on. [6]. II. MATERIALS AND METHODS A. Research Design This study used measurements against mercury tensimeters with positive pressure settings; 0mmHg, 50mmHg, 100mmHg, 150mmHg, 200mmHg, 250mmHg, 300mmHg, which can then be converted to kPa. Data retrieval repeated 6 times. [7] 1) Materials This study used the MPX 5050GP Sensor by Freescale Semiconductor to serve as an inflatable pressure. And the DHT22 Aosong Electronics Co.,Ltd sensor serves as a temperature, humidity sensor. Output sensor MPX 5050 GP then go to the input buffer circuit. The output of the buffer circuit then VCC, output and GND from the DHT 22 sensor legs then enter and be processed into the Arduino Nano. Arduino Nano as controller and controller. Arduino Nano output in the form of a display on the 2.4 inch TFT Nextion LCD[8][6]. 2) Experiments In this study, after the finished design, digital pressure meter (Positive Pressure) output testing was conducted with pressures of 0 mmHg, 50 mmHg, 100 mmHg, 150 mmHg, 200 mmHg, Accredited by Ministry of Research and Technology /National Research and Innovation Agency, Indonesia Decree No: 200/M/KPT/2020 Journal homepage: http://ijeeemi.poltekkesdepkes-sby.ac.id/index.php/ijeeemi 60 Indonesian Journal of Electronics, Electromedical, and Medical Informatics (IJEEEMI) Vol. 3, No. 2, May 2021, pp. 59-64 DOI: 10. 35882/ijeeemi.v3i2.4 ISSN: 2656-8624 250 mmHg, 300 mmHg, and measurements with the Tensimeter. Each setting, calculated to validate the results of this study. B. Block Diagram In this study, Positive data was obtained from cuff hoses and pump hoses from Tensimeters with several pressures namely 0 mmHg, 50 mmHg, 100 mmHg, 150 mmHg, 200 mmHg, 250 mmHg, 300 mmHg, shown in Figure. 1. MPX 5050 GP sensor as inflatable pressure. The sensor output then enters the buffer circuit input as a current amplifier without voltage amplifier occurring. The output buffer is then entered and processed into Arduino Nano. There is a conversion from mmHg to kPa to be processed to Arduino Nano as well. After processing using Arduino Nano, the output is a display on the 2.4 inch TFT Nextion LCD. [9] In Fig.1 Blog Diagrams it is explained that in the calibration process, the cuff hose and pump hose of the tensimeters used for calibration testing materials. MPX 5050 GP sensor as an inflatable pressure sensor. Output sensor further into the DHT 22 sensor as a humidity temperature sensor, VCC, output and ground are connected to the Arduino nano pin.[10] [11] then conduct a test for 60 seconds that serves as a time to perform a leak test when performing measurements on the tensimeter. Furthermore, the data displayed on the 2.4- inch TFT Nextion LCD serves as a display to display the measurement, calibration process. On the Digital Pressure Meter tool system, the LCD displays the result of pressure and conversion. C. Flowchart Start Initialization Temperature and Humidity Calibration? Measure the Pressure Display Pressure Leak test Start Timer Measure the Pressure Display Leak End Fig. 2 The system flowchart In figure 2 flow diagram starts when the module starts then there is initialization, there is the appearance of temperature, humidity, there are two modes of selection, namely positive mode and vacuum, when choosing a positive mode when doing manual pumping then the MPX 5050 GP sensor will read and the results will be displayed in positive mode measurement there is a 60-second timer for leak test. From the reading can be converted again pressure unit from mmHg to kPa and then the data is displayed on the LCD TFT Nextion 2.4 inch. III. RESULTS In this study, Digital Pressure Meter Module has been measured with Mercury Tensimeter tool Fig.3 Pengukuran pada tensimeter In fiq.3 The Digital Pressure Meter module contains each connector of the maximum pressure sensor output of the vacuum pressure of -400 mmHg 1) Digital Pressure Meter Module Design

Display used using LCD TFT Nextion fiq. 4 Fig. 4. Digital Pressure Display Accredited by Ministry of Research and Technology /National Research and Innovation Agency, Indonesia Decree No: 200/M/KPT/2020 Journal homepage: http://ijeeemi.poltekkesdepkes-sby.ac.id/index.php/ijeeemi 61 Indonesian Journal of Electronics, Electromedical, and Medical Informatics (IJEEEMI) Vol. 3, No. 2, May 2021, pp. 59-64 DOI: 10. 35882/ijeeemi.v3i2.4 ISSN: 2656-8624 Algorithm 1: Reading the Pressure TABLE II. ANOVA PARAMETER FOR SIGNIFICANT DIFFERENCE BETWEEN MEASUREMENT void loop(void) BEGIN Source of Variation SS MS F P-value F crit delay(50); Between sensorValue = analogRead(sensorPin); Groups 4,5714 2,28571 0,00019 0,9998 3,555 Vout = (sensorValue *5.0/1023.0)*1000; Within Value_Kpa= (Vout-165.29)/90; Groups 206556 11475,3 Value_mmHg = (Value_Kpa*7.5); Total 206561 static char tekananPositif[6]; In table 1 the results of the analysis showed no influence dtostrf(Value_mmHg, 3, 1, tekananPositif); (p=0.999) on measurements made for 3 x. Meanwhile, the t9.setText(tekananPositif); measurements in the module are carried out from 0 mmHg to delay(50); 300 mmHg can be seen in table II. END TABLE III THE VARIANCE CALCULATION AMONG MEASUREMENT Algoritme2: Humidity Temperature void bupdatePopCallback(void *ptr) Groups Count Sum Average Variance BEGIN Down 1 7 1036 148 11452,7 float h = dht.readHumidity(); float t = dht.readTemperature(); Down 2 7 1033 147,571 11518 IF (isnan(h) || isnan(t) ||) Down 3 7 1033 147,571 11585,3 THEN return; TABLE IV. ANOVA PARAMETER FOR SIGNIFICANT static char temperatureCTemp[6]; DIFFERENCE BETWEEN MEASUREMENT BEGIN dtostrf(t, 6, 2, temperatureCTemp); Source of tTempC.setText(temperatureCTemp); Variation SS F P-value F crit char hTemp[10] = {0}; Between utoa(int(h), hTemp, 10); Groups 0,8571 3,72E-05 0,99996 3,55 tHumidity.setText(hTemp); Within END Groups 207335 Total 207336 3) Measurement on Mercury Tensimeter Pressure measurements in the module range from 0 mmHg to In table II the analysis showed no influence (p=0.999) as 300 mmHg with the pressure measurement range rising per 50 long as the measurements performed on the measurements mmHg performed for 3 x measurements. The results of the dropped on the module from 0 mmHg to 300 mmHg. analysis can be seen in the table below. TABLE I. ANOVA SINGLE FACTOR IN MEASUREMENT OF INCREASING MODE Groups Increase 1 Increase 2 Increase 3 Count Sum 7 1038 7 1042 7 1046 Average 148,29 148,86 149,43 Variance 11504,9 11386,5 11534,6 Accredited by Ministry of Research and Technology /National Research and Innovation Agency, Indonesia Decree No: 200/M/KPT/2020 Journal homepage: http://ijeeemi.poltekkesdepkes-sby.ac.id/index.php/ijeeemi 62 Indonesian Journal of Electronics, Electromedical, and Medical Informatics (IJEEEMI) Vol. 3, No. 2, May 2021, pp. 59-64 DOI: 10. 35882/ijeeemi.v3i2.4 ISSN: 2656-8624 Blue=standard, Red=mmHg, Green=kPa 700 Pressure (mmHg, or kPa) 600 500 400 300 200 129.86 100 64.48 100 0 0 50 2260.81 12500 200 150 39.3 295 33.1 248 300 250 1 2 3 4 5 6 7 Number of Measurement Fig. 8. Convert mmHg Value to Kpa at Up Position 700 39.3 600 33.1 Pressure (mmHg, kPa) 500 26.5 400 19.8 300 300 13.6 250 200 200 150 6.5 100 100 50 0 0 1 2 3 4 5 Number of Measurement 6 7 Meansurement Value Value mmHg Value Kpa Fig. 9. Conversion of mmHg Value to Kpa at down position Data retrieval in this module is done with a standard mercury tensimeter and this measurement is done for 6 measurements. IV. DISCUSSION Positive pressure measurement of 0-300mmHg with a 50mmHg point increase obtained a reduction difference of - 3.3> 0 <3.3 with an average error factor of 2=0.39. In negative pressure measurements of 0-300 mmHg with a decrease of 50mmHg the difference of -3.7> 0 <3.7 with an error factor of rata2= 0.26, this meets calibration standards for uncertainty factors in measurement errors of 0.8. Measurement of this module is done by retrieving data on the mercury tensimeter tool 6 times. Thus, the results of the design is not much different from standard equipment. The result of moisture temperature measurement is done in the room with the module's humidity temperature parameter obtained room temperature of 25oC and humidity of 80%. With a difference of < 0.2 from the standard equipment measurement. IV. CONCLUSION The purpose of this study is to design a complete standard of the digital pressure meter equipped with temperature and humidity parameter. In the design of the DPM Two Modes module equipped thermo-hygrometer and overall pressure selection it was concluded that the Circuit made was in accordance with the needs of the DPM module, namely for ADC, touch screen display button. The result of positive pressure measurement at pressure 0 to 300 mmHg commonly used on mercury tensimeter has an error rate below normal 5%, ie rata2=0.39 while at negative pressure rata2 of 0.26 with module design has met calibration standards. Furthermore, the results of the measurement of temperature and humidity in the module have met the standard of measurement room, namely: temperature 25oC and inertia by 80%. For the future this design research can be developed in the design towards IoT. REFERENCE [1] A. de Greeff, I. Lorde, A. Wilton, P. Seed, A. J. Coleman, and A. H. Shennan, "Calibration accuracy of hospital- based non-invasive blood pressure measuring devices," J. Hum. Hypertens., vol. 24, no. 1, pp. 58–63, 2010. [2] D. A. Cholid, Ridwan, "Digital Pressure Meter Equipped with Temperature and Humidity," Indones. J. Electron. Electromed. Eng. Med. informatics, vol. 2, no. 1, pp. 1–5, 2020. [3] dkk N H Zunnur, "Kesesuaian Tipe Tensimeter Air Raksa Dan Tensimeter Pegas Terhadap Pengukuran Tekanan Darah Pada Usia Dewasa," Diponegoro Med. J. (Jurnal Kedokt. Diponegoro), vol. 6, no. 2, pp. 1208–1216, 2017. [4] M. R. N. Rokhman, B. G. Irianto, and H. G. Ariswati, "Digital Pressure Meter Tensimeter Dan Suction Pump," J. Teknokes, vol. 12, no. 1, pp. 1–4, 2019. [5] S. Vatsal and M. Bhavin, "Using Raspberry Pi To Sense Temprature and Relative Humidity," Int. Res. J. Eng. Technol., vol. 4, no. 2, pp. 380–385, 2017. [6] M. J. Turner, C. Speechly, and N. Bignell, "Sphygmomanometer calibration Why, how and how often?," Aust. Fam. Physician, vol. 36, no. 10, pp. 834– 837, 2007. [7] G. Avendaño, P. Fuentes, V. Castillo, C. Garcia, and N. Dominguez, "Reliability and safety of medical equipment by use of calibration and certification instruments," LATW2010 - 11th Latin-American Test Work., pp. 4–7, 2010. [8] J. Rosen, M. Brand, M. B. Fuchs, and M. Arcan, "A myosignal-based powered exoskeleton system," IEEE Accredited by Ministry of Research and Technology /National Research and Innovation Agency, Indonesia Decree No: 200/M/KPT/2020 Journal homepage: http://ijeeemi.poltekkesdepkes-sby.ac.id/index.php/ijeeemi 63 Indonesian Journal of Electronics, Electromedical, and Medical Informatics (IJEEEMI) Vol. 3, No. 2, May 2021, pp. 59-64 DOI: 10. 35882/ijeeemi.v3i2.4 ISSN: 2656-8624 Trans. Syst. Man, Cybern. Part ASystems Humans., vol. 31, no. 3, pp. 210–222, 2001. [9] E. O'Brien, B. Waeber, G. Parati, J. Staessen, and M. G. Myers, "Blood pressure measuring devices: Recommendations of the European Society of Hypertension," Br. Med. J., vol. 322, no. 7285, pp. 531– 536, 2001. [10] R. A. Koestoer, N. Pancasaputra, I. Roihan, and Harinaldi, "A simple calibration methods of relative humidity sensor DHT22 for tropical climates based on Arduino data acquisition system," AIP Conf. Proc., vol. 2062, no. January, 2019. [11] A. Pudji and M. R. Makruf, "Design of the Digital Pressure Meter with Thermohygrometer," Journal of Information Engineering and Applications, vol. 7, no. 9, pp. 35–39, 2017. [12] Y. A. Sihombing and S. Listiari, "Detection of air temperature, humidity and soil pH by using DHT22 and pH sensor based Arduino nano microcontroller," AIP Conf. Proc., vol. 2221, no. March, 2020. [13] DW Wulandari, E. Swistoro, and C. Connie, "Effectiveness of aneroid sphygmomanometer modification as a measurement of hydrostatic pressure and its implementation as props," PENDIPA J. Sci. Educ., Vol. 2, no. 1, pp. 82-87, 2018. [14] A. Türk and A. Hamarat, "Automated Pressure Calibration of Blood Pressure Measuring

Device Calibrator to Realize Its Traceability" Med. Meas. Appl. MeMeA 2019 - SAccredited by Ministry of Research and Technology /National Research and Innovation Agency, Indonesia Decree No: 200/M/KPT/2020 Journal homepage: http://ijeeemi.poltekkesdepkes-sby.ac.id/index.php/ijeeemi 60 Indonesian Journal of Electronics, Electromedical, and Medical Informatics (IJEEEMI) Vol. 3, No. 2, May 2021, pp. 59-64 DOI: 10. 35882/ijeeemi.v3i2.4 ISSN: 2656-8624 250 mmHg, 300 mmHg, and measurements with the Tensimeter. Each setting, calculated to validate the results of this study. B. Block Diagram In this study, Positive data was obtained from cuff hoses and pump hoses from Tensimeters with several pressures namely 0 mmHg, 50 mmHg, 100 mmHg, 150 mmHg, 200 mmHg, 250 mmHg, 300 mmHg, shown in Figure. 1. MPX 5050 GP sensor as inflatable pressure. The sensor output then enters the buffer circuit input as a current amplifier without voltage amplifier occurring. The output buffer is then entered and processed into Arduino Nano. There is a conversion from mmHg to kPa to be processed to Arduino Nano as well. After processing using Arduino Nano, the output is a display on the 2.4 inch TFT Nextion LCD. [9] In Fig.1 Blog Diagrams it is explained that in the calibration process, the cuff hose and pump hose of the tensimeters used for calibration testing materials. MPX 5050 GP sensor as an inflatable pressure sensor. Output sensor further into the DHT 22 sensor as a humidity temperature sensor, VCC, output and ground are connected to the Arduino nano pin.[10] [11] then conduct a test for 60 seconds that serves as a time to perform a leak test when performing measurements on the tensimeter. Furthermore, the data displayed on the 2.4- inch TFT Nextion LCD serves as a display to display the measurement, calibration process. On the Digital Pressure Meter tool system, the LCD displays the result of pressure and conversion. C. Flowchart Start Initialization Temperature and Humidity Calibration? Measure the Pressure Display Pressure Leak test Start Timer Measure the Pressure Display Leak End Fig. 2 The system flowchart In figure 2 flow diagram starts when the module starts then there is initialization, there is the appearance of temperature, humidity, there are two modes of selection, namely positive mode and vacuum, when choosing a positive mode when doing manual pumping then the MPX 5050 GP sensor will read and the results will be displayed in positive mode measurement there is a 60-second timer for leak test. From the reading can be converted again pressure unit from mmHg to kPa and then the data is displayed on the LCD TFT Nextion 2.4 inch. III. RESULTS In this study, Digital Pressure Meter Module has been measured with Mercury Tensimeter tool Fig.3 Pengukuran pada tensimeter In fiq.3 The Digital Pressure Meter module contains each connector of the maximum pressure sensor output of the vacuum pressure of -400 mmHg 1) Digital Pressure Meter Module Design Display used using LCD TFT Nextion fiq. 4 Fig. 4. Digital Pressure Display Accredited by Ministry of Research and Technology /National Research and Innovation Agency, Indonesia Decree No: 200/M/KPT/2020 Journal homepage: http://ijeeemi.poltekkesdepkes-sby.ac.id/index.php/ijeeemi 61 Indonesian Journal of Electronics, Electromedical, and Medical Informatics (IJEEEMI) Vol. 3, No. 2, May 2021, pp. 59-64 DOI: 10. 35882/ijeeemi.v3i2.4 ISSN: 2656-8624 Algorithm 1: Reading the Pressure TABLE II. ANOVA PARAMETER FOR SIGNIFICANT DIFFERENCE BETWEEN MEASUREMENT void loop(void) BEGIN Source of Variation SS MS F P-value F crit delay(50); Between sensorValue = analogRead(sensorPin); Groups 4,5714 2,28571 0,00019 0,9998 3,555 Vout = (sensorValue *5.0/1023.0)*1000; Within Value_Kpa= (Vout-165.29)/90; Groups 206556 11475,3 Value_mmHg = (Value_Kpa*7.5); Total 206561 static char tekananPositif[6]; In table 1 the results of the analysis showed no influence dtostrf(Value_mmHg, 3, 1, tekananPositif); (p=0.999) on measurements made for 3 x. Meanwhile, the t9.setText(tekananPositif); measurements in the module are carried out from 0 mmHg to delay(50); 300 mmHg can be seen in table II. END TABLE III THE VARIANCE

CALCULATION AMONG MEASUREMENT Algoritme2: Humidity Temperature void bupdatePopCallback(void *ptr) Groups Count Sum Average Variance BEGIN Down 1 7 1036 148 11452,7 float h = dht.readHumidity(); float t = dht.readTemperature(); Down 2 7 1033 147,571 11518 IF (isnan(h) || isnan(t) ||) Down 3 7 1033 147,571 11585,3 THEN return; TABLE IV. ANOVA PARAMETER FOR SIGNIFICANT static char temperatureCTemp[6]; DIFFERENCE BETWEEN MEASUREMENT BEGIN dtostrf(t, 6, 2, temperatureCTemp); Source of tTempC.setText(temperatureCTemp); Variation SS F P-value F crit char hTemp[10] = {0}; Between utoa(int(h), hTemp, 10); Groups 0,8571 3,72E-05 0,99996 3,55 tHumidity.setText(hTemp); Within END Groups 207335 Total 207336 3) Measurement on Mercury Tensimeter Pressure measurements in the module range from 0 mmHg to In table II the analysis showed no influence (p=0.999) as 300 mmHg with the pressure measurement range rising per 50 long as the measurements performed on the measurements mmHg performed for 3 x measurements. The results of the dropped on the module from 0 mmHg to 300 mmHg. analysis can be seen in the table below. TABLE I. ANOVA SINGLE FACTOR IN MEASUREMENT OF INCREASING MODE Groups Increase 1 Increase 2 Increase 3 Count Sum 7 1038 7 1042 7 1046 Average 148,29 148,86 149,43 Variance 11504,9 11386,5 11534,6 Accredited by Ministry of Research and Technology /National Research and Innovation Agency, Indonesia Decree No: 200/M/KPT/2020 Journal homepage: http://ijeeemi.poltekkesdepkes-sby.ac.id/index.php/ijeeemi 62 Indonesian Journal of Electronics, Electromedical, and Medical Informatics (IJEEEMI) Vol. 3, No. 2, May 2021, pp. 59-64 DOI: 10. 35882/ijeeemi.v3i2.4 ISSN: 2656-8624 Blue=standard, Red=mmHg, Green=kPa 700 Pressure (mmHg, or kPa) 600 500 400 300 200 129.86 100 64.48 100 0 0 50 2260.81 12500 200 150 39.3 295 33.1 248 300 250 1 2 3 4 5 6 7 Number of Measurement Fig. 8. Convert mmHg Value to Kpa at Up Position 700 39.3 600 33.1 Pressure (mmHg, kPa) 500 26.5 400 19.8 300 300 13.6 250 200 200 150 6.5 100 100 50 0 0 1 2 3 4 5 Number of Measurement 6 7 Meansurement Value Value mmHg Value Kpa Fig. 9. Conversion of mmHg Value to Kpa at down position Data retrieval in this module is done with a standard mercury tensimeter and this measurement is done for 6 measurements. IV. DISCUSSION Positive pressure measurement of 0-300mmHg with a 50mmHg point increase obtained a reduction difference of - 3.3> 0 <3.3 with an average error factor of 2=0.39. In negative pressure measurements of 0-300 mmHg with a decrease of 50mmHg the difference of -3.7> 0 <3.7 with an error factor of rata2= 0.26, this meets calibration standards for uncertainty factors in measurement errors of 0.8. Measurement of this module is done by retrieving data on the mercury tensimeter tool 6 times. Thus, the results of the design is not much different from standard equipment. The result of moisture temperature measurement is done in the room with the module's humidity temperature parameter obtained room temperature of 25oC and humidity of 80%. With a difference of < 0.2 from the standard equipment measurement. IV. CONCLUSION The purpose of this study is to design a complete standard of the digital pressure meter equipped with temperature and humidity parameter. In the design of the DPM Two Modes module equipped thermo-hygrometer and overall pressure selection it was concluded that the Circuit made was in accordance with the needs of the DPM module, namely for ADC, touch screen display button. The result of positive pressure measurement at pressure 0 to 300 mmHg commonly used on mercury tensimeter has an error rate below normal 5%, ie rata2=0.39 while at negative pressure rata2 of 0.26 with module design has met calibration standards. Furthermore, the results of the measurement of temperature and humidity in the module have met the standard of measurement room, namely: temperature 25oC and inertia by 80%. For the future this design research can be developed in the design towards IoT. REFERENCE [1] A. de Greeff, I. Lorde, A. Wilton, P. Seed, A. J.

Coleman, and A. H. Shennan, "Calibration accuracy of hospital- based non-invasive blood pressure measuring devices," J. Hum. Hypertens., vol. 24, no. 1, pp. 58–63, 2010. [2] D. A. Cholid, Ridwan, "Digital Pressure Meter Equipped with Temperature and Humidity," Indones. J. Electron. Electromed. Eng. Med. informatics, vol. 2, no. 1, pp. 1–5, 2020. [3] dkk N H Zunnur, "Kesesuaian Tipe Tensimeter Air Raksa Dan Tensimeter Pegas Terhadap Pengukuran Tekanan Darah Pada Usia Dewasa," Diponegoro Med. J. (Jurnal Kedokt. Diponegoro), vol. 6, no. 2, pp. 1208–1216, 2017. [4] M. R. N. Rokhman, B. G. Irianto, and H. G. Ariswati, "Digital Pressure Meter Tensimeter Dan Suction Pump," J. Teknokes, vol. 12, no. 1, pp. 1–4, 2019. [5] S. Vatsal and M. Bhavin, "Using Raspberry Pi To Sense Temprature and Relative Humidity," Int. Res. J. Eng. Technol., vol. 4, no. 2, pp. 380�0 mmHg, 50 mmHg, 100 mmHg, 150 mmHg, 200 mmHg, 250 mmHg, 300 mmHg, shown in Figure. 1. MPX 5050 GP sensor as inflatable pressure. The sensor output then enters the buffer circuit input as a current amplifier without voltage amplifier occurring. The output buffer is then entered and processed into Arduino Nano. There is a conversion from mmHg to kPa to be processed to Arduino Nano as well. After processing using Arduino Nano, the output is a display on the 2.4 inch TFT Nextion LCD. [9] In Fig.1 Blog Diagrams it is explained that in the calibration process, the cuff hose and pump hose of the tensimeters used for calibration testing materials. MPX 5050 GP sensor as an inflatable pressure sensor. Output sensor further into the DHT 22 sensor as a humidity temperature sensor, VCC, output and ground are connected to the Arduino nano pin.[10] [11] then conduct a test for 60 seconds that serves as a time to perform a leak test when performing measurements on the tensimeter. Furthermore, the data displayed on the 2.4- inch TFT Nextion LCD serves as a display to display the measurement, calibration process. On the Digital Pressure Meter tool system, the LCD displays the result of pressure and conversion. C. Flowchart Start Initialization Temperature and Humidity Calibration? Measure the Pressure Display Pressure Leak test Start Timer Measure the Pressure Display Leak End Fig. 2 The system flowchart In figure 2 flow diagram starts when the module starts then there is initialization, there is the appearance of temperature, humidity, there are two modes of selection, namely positive mode and vacuum, when choosing a positive mode when doing manual pumping then the MPX 5050 GP sensor will read and the results will be displayed in positive mode measurement there is a 60-second timer for leak test. From the reading can be converted again pressure unit from mmHg to kPa and then the data is displayed on the LCD TFT Nextion 2.4 inch. III. RESULTS In this study, Digital Pressure Meter Module has been measured with Mercury Tensimeter tool Fig.3 Pengukuran pada tensimeter In fiq.3 The Digital Pressure Meter module contains each connector of the maximum pressure sensor output of the vacuum pressure of -400 mmHg 1) Digital Pressure Meter Module Design Display used using LCD TFT Nextion fiq. 4 Fig. 4. Digital Pressure Display Accredited by Ministry of Research and Technology /National Research and Innovation Agency, Indonesia Decree No: 200/M/KPT/2020 Journal homepage: http://ijeeemi.poltekkesdepkes-sby.ac.id/index.php/ijeeemi 61 Indonesian Journal of Electronics, Electromedical, and Medical Informatics (IJEEEMI) Vol. 3, No. 2, May 2021, pp. 59-64 DOI: 10. 35882/ijeeemi.v3i2.4 ISSN: 2656-8624 Algorithm 1: Reading the Pressure TABLE II. ANOVA PARAMETER FOR SIGNIFICANT DIFFERENCE BETWEEN MEASUREMENT void loop(void) BEGIN Source of Variation SS MS F P-value F crit delay(50); Between sensorValue = analogRead(sensorPin); Groups 4,5714 2,28571 0,00019 0,9998 3,555 Vout = (sensorValue *5.0/1023.0)*1000; Within Value_Kpa= (Vout-165.29)/90; Groups 206556 11475,3 Value_mmHg = (Value_Kpa*7.5); Total 206561 static char tekananPositif[6]; In table 1 the results of the analysis showed no influence dtostrf(Value_mmHg, 3, 1, tekananPositif); (p=0.999) on measurements made for 3 x. Meanwhile, the t9.setText(tekananPositif); measurements in the module are carried out from 0 mmHg to delay(50); 300 mmHg can be seen in table II. END TABLE III THE VARIANCE CALCULATION AMONG MEASUREMENT Algoritme2: Humidity Temperature void bupdatePopCallback(void *ptr) Groups Count Sum Average Variance BEGIN Down 1 7 1036 148 11452,7 float h = dht.readHumidity(); float t = dht.readTemperature(); Down 2 7 1033 147,571 11518 IF (isnan(h) || isnan(t) ||) Down 3 7 1033 147,571 11585,3 THEN return; TABLE IV. ANOVA PARAMETER FOR SIGNIFICANT static char temperatureCTemp[6]; DIFFERENCE BETWEEN MEASUREMENT BEGIN dtostrf(t, 6, 2, temperatureCTemp); Source of tTempC.setText(temperatureCTemp); Variation SS F P-value F crit char hTemp[10] = {0}; Between utoa(int(h), hTemp, 10); Groups 0,8571 3,72E-05 0,99996 3,55 tHumidity.setText(hTemp); Within END Groups 207335 Total 207336 3) Measurement on Mercury Tensimeter Pressure measurements in the module range from 0 mmHg to In table II the analysis showed no influence (p=0.999) as 300 mmHg with the pressure measurement range rising per 50 long as the measurements performed on the measurements mmHg performed for 3 x measurements. The results of the dropped on the module from 0 mmHg to 300 mmHg. analysis can be seen in the table below. TABLE I. ANOVA SINGLE FACTOR IN MEASUREMENT OF INCREASING MODE Groups Increase 1 Increase 2 Increase 3 Count Sum 7 1038 7 1042 7 1046 Average 148,29 148,86 149,43 Variance 11504,9 11386,5 11534,6 Accredited by Ministry of Research and Technology /National Research and Innovation Agency, Indonesia Decree No: 200/M/KPT/2020 Journal homepage: http://ijeeemi.poltekkesdepkes-sby.ac.id/index.php/ijeeemi 62 Indonesian Journal of Electronics, Electromedical, and Medical Informatics (IJEEEMI) Vol. 3, No. 2, May 2021, pp. 59-64 DOI: 10. 35882/ijeeemi.v3i2.4 ISSN: 2656-8624 Blue=standard, Red=mmHg, Green=kPa 700 Pressure (mmHg, or kPa) 600 500 400 300 200 129.86 100 64.48 100 0 0 50 2260.81 12500 200 150 39.3 295 33.1 248 300 250 1 2 3 4 5 6 7 Number of Measurement Fig. 8. Convert mmHg Value to Kpa at Up Position 700 39.3 600 33.1 Pressure (mmHg, kPa) 500 26.5 400 19.8 300 300 13.6 250 200 200 150 6.5 100 100 50 0 0 1 2 3 4 5 Number of Measurement 6 7 Meansurement Value Value mmHg Value Kpa Fig. 9. Conversion of mmHg Value to Kpa at down position Data retrieval in this module is done with a standard mercury tensimeter and this measurement is done for 6 measurements. IV. DISCUSSION Positive pressure measurement of 0-300mmHg with a 50mmHg point increase obtained a reduction difference of - 3.3> 0 <3.3 with an average error factor of 2=0.39. In negative pressure measurements of 0-300 mmHg with a decrease of 50mmHg the difference of -3.7> 0 <3.7 with an error factor of rata2= 0.26, this meets calibration standards for uncertainty factors in measurement errors of 0.8. Measurement of this module is done by retrieving data on the mercury tensimeter tool 6 times. Thus, the results of the design is not much different from standard equipment. The result of moisture temperature measurement is done in the room with the module's humidity temperature parameter obtained room temperature of 25oC and humidity of 80%. With a difference of < 0.2 from the standard equipment measurement. IV. CONCLUSION The purpose of this study is to design a complete standard of the digital pressure meter equipped with temperature and humidity parameter. In the design of the DPM Two Modes module equipped thermo-hygrometer and overall pressure selection it was concluded that the Circuit made was in accordance with the needs of the DPM module, namely for ADC, touch screen display button. The result of positive pressure measurement at pressure 0 to 300 mmHg commonly used on mercury tensimeter has an error rate below normal 5%, ie rata2=0.39 while at negative pressure rata2 of 0.26 with module design has met calibration standards. Furthermore, the results of the measurement of temperature and humidity in the module have met the standard of measurement room, namely: temperature 25oC and inertia by 80%. For the future this design research can be developed in the design towards

IoT. REFERENCE [1] A. de Greeff, I. Lorde, A. Wilton, P. Seed, A. J. Coleman, and A. H. Shennan, "Calibration accuracy of hospital- based non-invasive blood pressure measuring devices," J. Hum. Hypertens., vol. 24, no. 1, pp. 58–63, 2010. [2] D. A. Cholid, Ridwan, "Digital Pressure Meter Equipped with Temperature and Humidity," Indones. J. Electron. Electromed. Eng. Med. informatics, vol. 2, no. 1, pp. 1–5, 2020. [3] dkk N H Zunnur, "Kesesuaian Tipe Tensimeter Air Raksa Dan Tensimeter Pegas Terhadap Pengukuran Tekanan Darah Pada Usia Dewasa," Diponegoro Med. J. (Jurnal Kedokt. Diponegoro), vol. 6, no. 2, pp. 1208–1216, 2017. [4] M. R. N. Rokhman, B. G. Irianto, and H. G. Ariswati, "Digital Pressure Meter Tensimeter Dan Suction Pump," J. Teknokes, vol. 12, no. 1, pp. 1–4, 2019. [5] S. Vatsal and M. Bhavin, "Using Raspberry Pi To Sense Temprature and Relative Humidity," Int. Res. J. Eng. Technol., vol. 4, no. 2, pp. 380–385, 2017. [6] M. J. Turner, C. Speechly, and N. Bignell, "Sphygmomanometer calibration Why, how and how often?," Aust. Fam. Physician, vol. 36, no. 10, pp. 834– 837, 2007. [7] G. Avendaño, P. Fuentes, V. Castillo, C. Garcia, and N. Dominguez, "Reliability and safety of medical equipment by use of calibration and certification instruments," LATW2010 - 11th Latin-American Test Work., pp. Source of Variation SS MS F P-value F crit delay(50); Between sensorValue = analogRead(sensorPin); Groups 4,5714 2,28571 0,00019 0,9998 3,555 Vout = (sensorValue *5.0/1023.0)*1000; Within Value_Kpa= (Vout-165.29)/90; Groups 206556 11475,3 Value_mmHg = (Value_Kpa*7.5); Total 206561 static char tekananPositif[6]; In table 1 the results of the analysis showed no influence dtostrf(Value_mmHg, 3, 1, tekananPositif); (p=0.999) on measurements made for 3 x. Meanwhile, the t9.setText(tekananPositif); measurements in the module are carried out from 0 mmHg to delay(50); 300 mmHg can be seen in table II. END TABLE III THE VARIANCE CALCULATION AMONG MEASUREMENT Algoritme2: Humidity Temperature void bupdatePopCallback(void *ptr) Groups Count Sum Average Variance BEGIN Down 1 7 1036 148 11452,7 float h = dht.readHumidity(); float t = dht.readTemperature(); Down 2 7 1033 147,571 11518 IF (isnan(h) || isnan(t) ||) Down 3 7 1033 147,571 11585,3 THEN return; TABLE IV. ANOVA PARAMETER FOR SIGNIFICANT static char temperatureCTemp[6]; DIFFERENCE BETWEEN MEASUREMENT BEGIN dtostrf(t, 6, 2, temperatureCTemp); Source of tTempC.setText(temperatureCTemp); Variation SS F P-value F crit char hTemp[10] = {0}; Between utoa(int(h), hTemp, 10); Groups 0,8571 3,72E-05 0,99996 3,55 tHumidity.setText(hTemp); Within END Groups 207335 Total 207336 3) Measurement on Mercury Tensimeter Pressure measurements in the module range from 0 mmHg to In table II the analysis showed no influence (p=0.999) as 300 mmHg with the pressure measurement range rising per 50 long as the measurements performed on the measurements mmHg performed for 3 x measurements. The results of the dropped on the module from 0 mmHg to 300 mmHg. analysis can be seen in the table below. TABLE I. ANOVA SINGLE FACTOR IN MEASUREMENT OF INCREASING MODE Groups Increase 1 Increase 2 Increase 3 Count Sum 7 1038 7 1042 7 1046 Average 148,29 148,86 149,43 Variance 11504,9 11386,5 11534,6 Accredited by Ministry of Research and Technology /National Research and Innovation Agency, Indonesia Decree No: 200/M/KPT/2020 Journal homepage: http://ijeeemi.poltekkesdepkes-sby.ac.id/index.php/ijeeemi 62 Indonesian Journal of Electronics, Electromedical, and Medical Informatics (IJEEEMI) Vol. 3, No. 2, May 2021, pp. 59-64 DOI: 10. 35882/ijeeemi.v3i2.4 ISSN: 2656-8624 Blue=standard, Red=mmHg, Green=kPa 700 Pressure (mmHg, or kPa) 600 500 400 300 200 129.86 100 64.48 100 0 0 50 2260.81 12500 200 150 39.3 295 33.1 248 300 250 1 2 3 4 5 6 7 Number of Measurement Fig. 8. Convert mmHg Value to Kpa at Up Position 700 39.3 600 33.1 Pressure (mmHg, kPa) 500 26.5 400 19.8 300 300 13.6 250 200 200 150 6.5 100 100 50 0 0 1 2 3 4 5 Number of Measurement 6 7 Meansurement Value Value mmHg Value Kpa Fig. 9. Conversion of mmHg Value to Kpa at down position Data retrieval in this module is done with a standard mercury tensimeter and this measurement is done for 6 measurements. IV. DISCUSSION Positive pressure measurement of 0-300mmHg with a 50mmHg point increase obtained a reduction difference of - 3.3> 0 <3.3 with an average error factor of 2=0.39. In negative pressure measurements of 0-300 mmHg with a decrease of 50mmHg the difference of -3.7> 0 <3.7 with an error factor of rata2= 0.26, this meets calibration standards for uncertainty factors in measurement errors of 0.8. Measurement of this module is done by retrieving data on the mercury tensimeter tool 6 times. Thus, the results of the design is not much different from standard equipment. The result of moisture temperature measurement is done in the room with the module's humidity temperature parameter obtained room temperature of 25oC and humidity of 80%. With a difference of < 0.2 from the standard equipment measurement. IV. CONCLUSION The purpose of this study is to design a complete standard of the digital pressure meter equipped with temperature and humidity parameter. In the design of the DPM Two Modes module equipped thermo-hygrometer and overall pressure selection it was concluded that the Circuit made was in accordance with the needs of the DPM module, namely for ADC, touch screen display button. The result of positive pressure measurement at pressure 0 to 300 mmHg commonly used on mercury tensimeter has an error rate below normal 5%, ie rata2=0.39 while at negative pressure rata2 of 0.26 with module design has met calibration standards. Furthermore, the results of the measurement of temperature and humidity in the module have met the standard of measurement room, namely: temperature 25oC and inertia by 80%. For the future this design research can be developed in the design towards IoT. REFERENCE [1] A. de Greeff, I. Lorde, A. Wilton, P. Seed, A. J. Coleman, and A. H. Shennan, "Calibration accuracy of hospital- based non-invasive blood pressure measuring devices," J. Hum. Hypertens., vol. 24, no. 1, pp. 58–63, 2010. [2] D. A. Cholid, Ridwan, "Digital Pressure Meter Equipped with Temperature and Humidity," Indones. J. Electron. Electromed. Eng. Med. informatics, vol. 2, no. 1, pp. 1–5, 2020. [3] dkk N H Zunnur, "Kesesuaian Tipe Tensimeter Air Raksa Dan Tensimeter Pegas Terhadap Pengukuran Tekanan Darah Pada Usia Dewasa," Diponegoro Med. J. (Jurnal Kedokt. Diponegoro), vol. 6, no. 2, pp. 1208–1216, 2017. [4] M. R. N. Rokhman, B. G. Irianto, and H. G. Ariswati, "Digital Pressure Meter Tensimeter Dan Suction Pump," J. Teknokes, vol. 12, no. 1, pp. 1–4, 2019. [5] S. Vatsal and M. Bhavin, "Using Raspberry Pi To Sense Temprature and Relative Humidity," Int. Res. J. Eng. Technol., vol. 4, no. 2, pp. 380–385, 2017. [6] M. J. Turner, C. Speechly, and N. Bignell, "Sphygmomanometer calibration Why, how and how often?," Aust. Fam. Physician, vol. 36, no. 10, pp. 834– 837, 2007. [7] G. Avendaño, P. Fuentes, V. Castillo, C. Garcia, and N. Dominguez, "Reliability and safety of medical equipment by use of calibration and certification instruments," LATW2010 - 11th Latin-American Test Work., pp. 4–7, 2010. [8] J. Rosen, M. Brand, M. B. Fuchs, and M. Arcan, "A myosignal-based powered exoskeleton system," IEEE Accredited by Ministry of Research and Technology /National Research and Innovation Agency, Indonesia Decree No: 200/M/KPT/2020 Journal homepage: http://ijeeemi.poltekkesdepkes-sby.ac.id/index.php/ijeeemi 63 Indonesian Journal of Electronics, Electromedical, and Medical Informatics (IJEEEMI) Vol. 3, No. 2, May 2021, pp. 59-64 DOI: 10. 35882/ijeeemi.v3i2.4 ISSN: 2656-8624 Trans. Syst. Man, Cybern. Part ASystems Humans., vol. 31, no. 3, pp. 210–222, 2001. [9] E. O'Brien, B. Waeber, G. Parati, J. Staessen, and M. G. Myers, "Blood pressure measuring devices: Recommendations of the European Society of Hypertension," Br. Med. J., vol. 322, no. 7285, pp. 531– 536, 2001. [10] R. A. Koestoer, N. Pancasaputra, I. Roihan, and Harinaldi, "A simple calibration methods of relative humidity sensor DHT22 for tropical climates based on Arduino data acquisition system," AIP Conf. Proc., vol. 2062, no. January, 2019.

[11] A. Pudji and M. R. Makruf, “Design of the Digital Pressure Meter with Thermohygrometer,” Journal of Information Engineering and Applications, vol. 7, no. 9, pp. 35–39, 2017. [12] Y. A. Sihombing and S. Listiari, “Detection of air temperature, humidity and soil pH by using DHT22 and pH sensor based Arduino nano microcontroller,” AIP Conf. Proc., vol. 2221, no. March, 2020. [13] DW Wulandari, E. Swistoro, and C. Connie, "Effectiveness of aneroid sphygmomanometer modification as a measurement of hydrostatic pressure and its implementation as props," PENDIPA J. Sci. Educ., Vol. 2, no. 1, pp. 82-87, 2018. [14] A. Türk and A. Hamarat, "Automated Pressure Calibration of Blood Pressure Measuring Device Calibrator to Realize Its Traceability" Med. Meas. Appl. MeMeA 2019 - Symp. Proc., Pp. 1-5, 2019. [15] RF Muldiani and K. Hadiningrum, "Optimization Tool Practical Law of Thermodynamics," Pros. SNFA (Seminar Nas. Fis. And App., Vol. 3, pp. 237-245, 2018. Accredited by Ministry of Research and Technology /National Research and Innovation Agency, Indonesia Decree No: 200/M/KPT/2020 Journal homepage: http://ijeeemi.poltekkesdepkes-sby.ac.id/index.php/ijeeemi 64