



## **UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

### **DEVELOPMENT AND EXPERIMENTAL STUDY OF SMART DIAL GAUGE TO PERFORM DATA LOGGING AND ANALYSIS FOR SURFACE ROUGHNESS CHECK**

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electronics Engineering Technology (Industrial Electronics) with Honours.

by

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Tajuk: DEVELOPMENT AND EXPERIMENTAL STUDY OF SMART DIAL  
GAUGE TO PERFORM DATA LOGGING AND ANALYSIS FOR SURFACE  
ROUGHNESS CHECK

Sesi Pengajian: 2019

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## **ABSTRACT**

Dial Gauge is a measuring instrument which will be used widely in industry to measure the small distances between two surfaces or small amount of component travel. This device is widely used in manufacturing industry at present. Currently, in most industry the measuring and recoding process using the dial gauge is done manually. Observing and recording is the manual method used. When the method introduced from this project is used, the time taken for the measuring and recoding process can be reduced. Semi-automatic reading recording is required to shorten the time taken and improve the productivity of the measurement. This project will make the reading and recording process using the dial gauge easier. It presents a simple wireless design of dial gauge that can transfer the reading that had been measured wirelessly through Bluetooth to be recorded in Microsoft Excel Software using data logging principle. The analysis graph also can be made using the recorded reading in the Microsoft Excel Software. Electronic dial gauge is used in this project for easier data detection. Finally, this developed measuring device can record the data in much lower time. It is also having a good application prospect, especially for industrial environment which require shorter time and lower cost.

## ABSTRAK

Dial Gauge adalah alat ukur yang akan digunakan secara meluas untuk mengukur perubahan jarak yang sangat kecil antara dua permukaan. Pada masa kini, alat ini digunakan secara meluas dalam industri perkilangan. Proses mengukur dan mencatat menggunakan “Dial Gauge” yang sedang digunakan pada masa kini dilakukan secara manual. Kaedah manual yang sedang digunakan ialah Mengukur dan mencatat. Masa dan juga bilangan perkerja yang sedia ada dapat dikurangkan dengan penggunaan kaedah “data logging”. Proses Merekod separa automatik diperlukan untuk meningkatkan kecekapan dan mengurangkan masa yang diambil untuk pengukuran. Projek ini akan menjadikan proses bacaan dan catatan menggunakan “Dial Gauge” lebih mudah.. Projek ini membentangkan tentang reka bentuk “Dial Gauge” tanpa wayar dan memudahkan pindaan bacaan yang telah diukur tanpa wayar untuk direkodkan dalam Software “Microsoft Excel” melalui penggunaan prinsip “data logging”. Analisis Graf juga boleh dibuat menggunakan bacaan yang diambil dengan menggunakan “Software Microsoft Excel”. Akhirnya, projek ini mempunyai prospek pengaplikasian yang baik, terutamanya dalam sektor industri yang memerlukan masa yang lebih singkat dan kos yang lebih rendah.

## **DEDICATION**

To My Beloved Parents Mr Muniandy Singaram & Manoranjitham

My Supportive Supervisor Mr Wan Norhisyam Bin Rashid and

Helpful Co- Supervisor Mr Mazran Bin Ahmad

My Friends, Lecturers and

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## LIST OF SYMBOLS

<b>MHz</b>	Mega-Hertz
<b>GHz</b>	Giga-Hertz
<b>Kbps</b>	Kilo-bits per second
<b>%</b>	Percentage

## LIST OF ABBREVIATIONS

<b>3D</b>	Three Dimension
<b>AMR</b>	Automatic Meter Reading
<b>APM</b>	Automatic Polling Mechanism
<b>ARM</b>	Advanced RISC Machine
<b>BLE</b>	Bluetooth Low Energy
<b>CCD</b>	Charged Coupled Device
<b>CI</b>	Cochlear Implant
<b>COM PORT</b>	Communication Port
<b>CSR</b>	Cambridge Silicon Radio Limited
<b>CTRM</b>	Composites Technology Research Malaysia
<b>EEG</b>	Electroencephalogram
<b>FTK</b>	Engineering Technology Faculty
<b>GB</b>	Gigabyte
<b>GPIB</b>	General Purpose Interface Bus
<b>GPS</b>	Global Positioning System
<b>GUI</b>	Graphical User Interface
<b>HCI</b>	Human Computer Interaction
<b>IEEE</b>	Institute of Electrical and Electronics Engineers
<b>IP</b>	Internet Protocol
<b>ISM BAND</b>	Industrial, Scientific and Medical Radio Band
<b>JSON</b>	JavaScript Object Notation
<b>LAN</b>	Local Area Network

<b>MCU</b>	Microcontroller Unit
<b>PAN</b>	Personal Area Network
<b>PC</b>	Personal Computer
<b>PSM</b>	Project Sarjana Muda
<b>RISC</b>	Reduced Instruction Set Computer
<b>SNHL</b>	Significant Sensorineural Hearing Loss
<b>SPC</b>	Statistical Process Control
<b>SPI</b>	Serial Peripheral Interface Bus
<b>TCP</b>	Transmission Control Protocol
<b>UART</b>	Universal Asynchronous Receiver-Transmitter
<b>USB</b>	Universal Serial Bus
<b>UTeM</b>	Universiti Teknikal Malaysia Melaka
<b>UUT</b>	Unit Under Test
<b>WI-FI</b>	Wireless Fidelity
<b>WLAN</b>	Wireless Local Area Network
<b>WPAN</b>	Wireless Personal Area Network
<b>WUA</b>	Water User Association

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# CHAPTER 1

## INTRODUCTION

### 1.1 Introduction

Currently, there are many measuring instruments been used in manufacturing industry to measure small length, angles which cannot be measured by normal measuring instrument. This small length, angles require a special instrument which are specifically designed and amplify the small length, angles to make it obvious. Although it is a very small distance or length, it should be given importance in certain industries such as Aviation industry, Metal Manufacturing Industry, Mechanical Processes and many more.

Dial Gauge is a measuring instrument which will be used widely in to measure the small distance between two surfaces or small amount of component travel. The measurement reading of the dial gauge is obtained by manual observation and recording method. When this method is used the testing efficiency and accuracy will be low. Besides that, the manual recording process also will consume a lot of time, energy and cost.

To improve the time taken for the measuring and recording process semi-automatic data logging method should be used. Thus, the Development and Experimental study of Smart Dial Gauge to perform Data Logging and Analysis for Surface Roughness Check project is introduced. Data-logging is a form where electronica devices are used to sense, measure and record physical in experimental

settings. By using the Data Logger, data can be collected remotely and consequently downloaded into a computer.

The aim of this project is to reduce the time taken, cost and number of labors used for the measuring and recording process using dial gauge. The time taken, cost and number of labor that had been reduced in this measurement process can be directed or used in other work which can increase the company production and profit.

The data logging that is performed automatically will reduce human error. Besides that, an analysis that is performed with the data of the measured reading can be used as record for emergency situation or for development and improvement purposes. Electronic dial gauge is used in this project because digital reading can be easily transferred to the computer and this dial gauge is more accurate than the analogue dial gauge.

To achieve this goal on time, there are several tasks were set that are:

- a) Study on the electronic dial gauge working principle and data extraction process
- b) Assemble Bluetooth device to the existing dial gauge
- c) Transfer data from the dial gauge to computer using Bluetooth module
- d) Perform Data Logging Processes

## 1.2 Problem Statement

Currently, the measuring and recoding process using dial gauge in aviation industry consume a lot of time and man power. The aviation industry that were taken for the reference is CTRM industry.

CTRM industry quality check department looking for minimizing the time taken for the measuring process. With the increasing of time taken for recording process measuring process, the delivery date of the product to the customer also increases.

The time taken for recoding can be overcome by using extra labor. However, if extra labor is used to solve this issue extra cost need to be spend. Thus, a device that can solve all the issue above need to be designed. The measuring device can also help in providing analysis for the measurement performed so that it can be used for the future development.

Besides that, data that had been measured also needed to be kept without loss by the industry because it will be needed for future documentation and as a prove of delivery to the customer as well as for the company reference. Hard copy documentation alone is another problem faced by the CTRM industry for keeping the record.