

Automatic Digital Compression Testing Machine With Labview

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Abstract—Digital Automatic Compression Testing Machine is used for testing of kinetic properties of the material or object. They provide the output precisely. This machine is offered for its less maintenance and simple operation. The mechanical force is applied on the cube by moving the stem in downward direction. This movement of stem is continuously until break point of cube is not achieved. As the break point of cube or object is achieved, the whole data is recorded and shown in graph. Monitoring of data is on Labview software & Record of the same data is shown in excel sheet. The controlling of machine is done by PLC Software (SAMKOON) & the total data is acquired on Labview software and recorded in excel sheet.

Index Terms- Compression testing machine, Human machine interface, proving ring, Load cell, proximity sensor, linear variable differential transducer, LABVIEW, programmable logic controller.

I. INTRODUCTION

Automation is an assignment of human control functions to technical equipment for increasing productivity, better quality, increasing safety in working conditions reducing manpower & cost. Continuous monitoring and controlling of industries are required due to the large amount of production. Compression testing machine being a major tool for ascertaining quality of work, has to be reviewed for its efficiency and correctness after regular time intervals. The digital compression testing machine has been designed to meet the need for a simple, economic and reliable means to test concrete for its compressive strength. The digital machines are provided with a pace rate controller, to enable maintain a constant of loading. The design expressive of simplicity, both of construction and operation, makes the machine easy to use and maintain. The unit is compact, making it useful for site and Laboratory applications. The Loading capacity is 1000KN, 2000KN, and 3000KN can be tested using the appropriate spacers.

II.SYSTEM ARCHITECTURE

In this diagram the digital compression testing machine is connected with the Programmable logic controller and Human machine interface display.

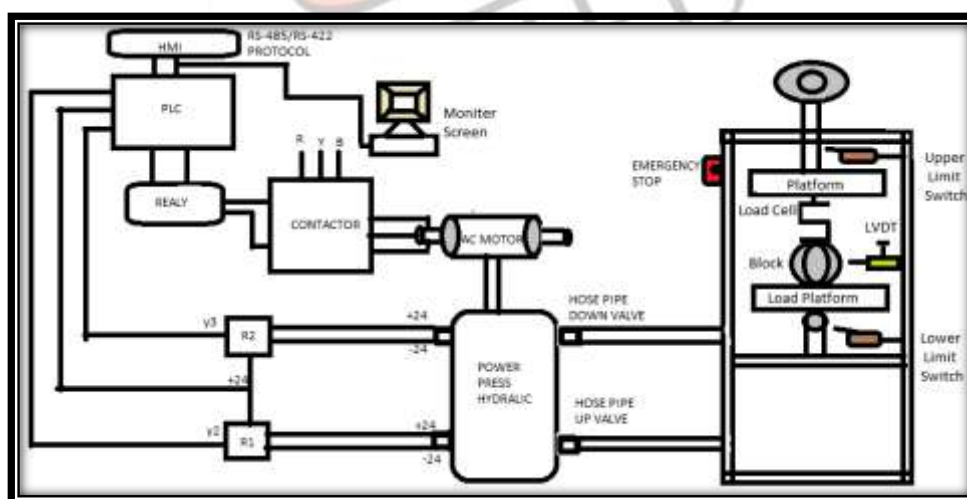


Figure 1: Block Diagram of CTM

When we give the start command to motor by Human machine interface at that time the ac motor is run (In forward or reversed direction as per command). So the piston assembly is going to the upward direction and goes until we can't find its break point. As we get the cube's break point, human machine interface stop the motor to run. Motor and piston arrangement is like that ac motor rotating motion is converted into linear motion of piston (up and down).



Figure 2: Compression Testing Machine

III.EASE OF USE

Compression Testing Machine being a major tool for ascertaining quality of work, has to be reviewed for its efficiency and correctness after regular time intervals. Digital compression testing machine is giving an accurate value compare to analog compression testing machine. The analog compression testing machine is handled manually whether in digital compression testing machine operation is done by automatically as per given command.

IV.PREPARE YOUR PAPER BEFORE STYLING

There are two limit switches for controlling motor position. Cube's break point is find out by upper limit switch. As piston reached at upper limit switch means at maximum compression the motor is stopped. And the data is display, recorded in excel sheet.

Abbreviations and Acronyms

Name	Full name
LabVIEW	Laboratory Virtual Instrument Engineering Workbench
HMI	Human Machine Interface
LVDT	Linear Variable Differential Transducer
PLC	Programmable Logic Controller
SMPS	Switch Mode Power Supply
Rs-485/422	Communication Cable
R1,R2	Relay1,Relay2

Units

Units	Name of unit	Measurement
KG	Kilogram	Weight Measurement
KN	Kilonewton	Force measurement
MM	Millimeter	Length Measurement

Equations

Definition of compression: External force (stress) that tends to crush a material, squeezing its particles closer and shortening the dimension in the direction of its action.

Break point: Point at which the load burst down or in our case point at which load fully compressed.

$$\text{Known Load} = \text{Load in K.G.} * 9.81/1000$$

$$1\text{KN} = 9.81\text{Kg}$$

HMI OPERATING WINDOW

Select operation by choosing appropriate action from Human machine interface operating window. Emergency stop button is also available in this digital compression testing machine. In this display window 4 button are given. We press the start test button the test window is open. Same as operation, calibration, and Parameter button press then the operation windows are open. and we make the operation of the machine.

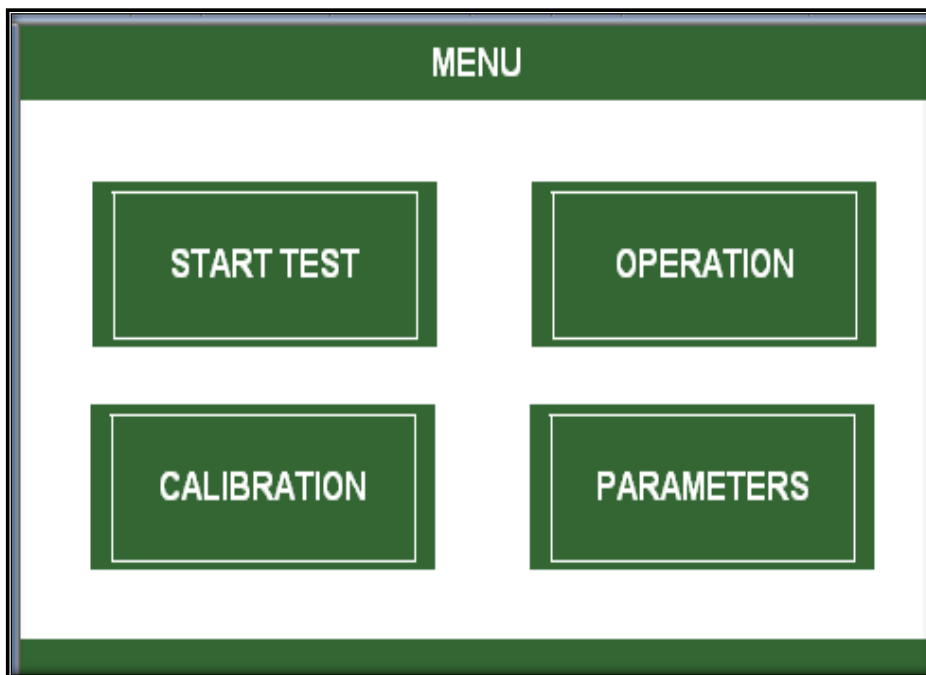


Figure 3: Display Window

The graph shows the load v/s compression. Here is standard table which shows resultant value of load v/compression. The force is applied on the block, block is compressed at degree of change. We measure the value of load v/s compression in the labview screen graph.

Applied force	Position 0	180	360	Average	Expanded uncertainty
5	70.8	71.0	70.8	70.9	0.24
10	142.0	142.0	142.2	142.1	0.22
15	213.8	214.0	214.0	213.8	0.21
20	266.2	266.5	286.2	266.3	0.20
25	358.0	358.2	356.0	358.1	0.19
30	431.0	431.2	431.5	431.2	0.18
35	503.5	503.8	503.8	503.9	0.17

Figure 4: Standard table of load v/s compression

The graph shows the value of compression at given load.

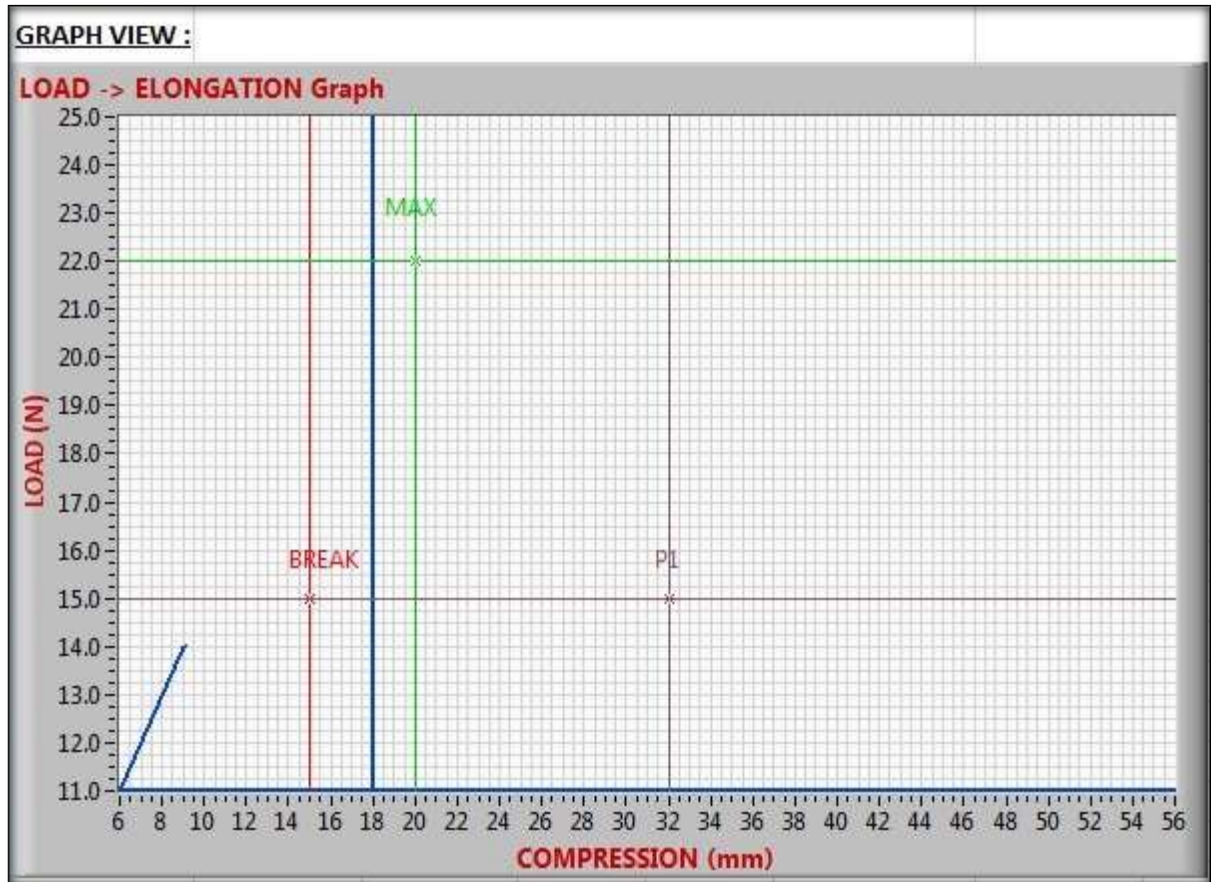


Figure 5: LOAD vs. COMPRESSION GRAPH

LABVIEW Screen

The block diagram of LABVIEW screen is shown in figure.

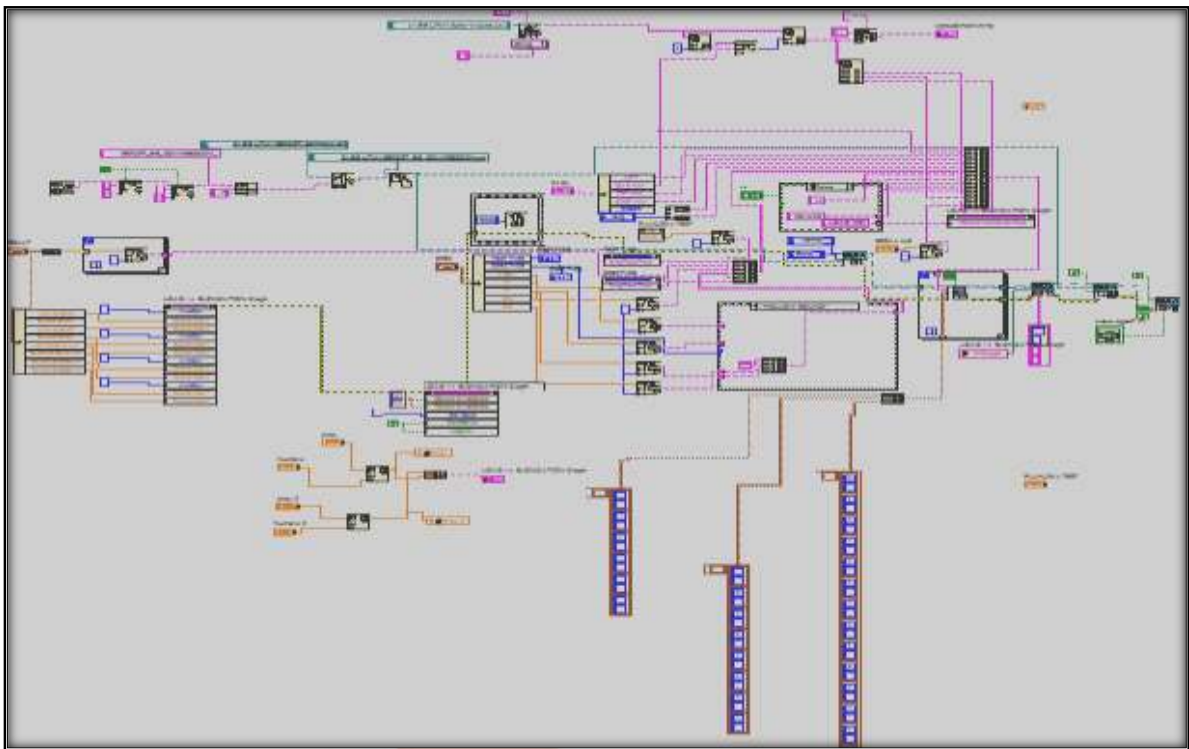


Figure 6: Labview Programming

Main operating screen of HMI

HMI screen shows the value of actual compression, maximum load, corrected load, extension and maximum extension. Whatever value are you want to show that is display on Human machine interface screen. the start and stop button is used for the motor operation. We press the start button the motor is start. and press the stop button at the motor operation is stop. Forward and reversed button also used for motor operate in both direction. When we give the command of forward, the motor is start to rotate in forward direction. And we press the reversed button, motor operated in reversed direction.

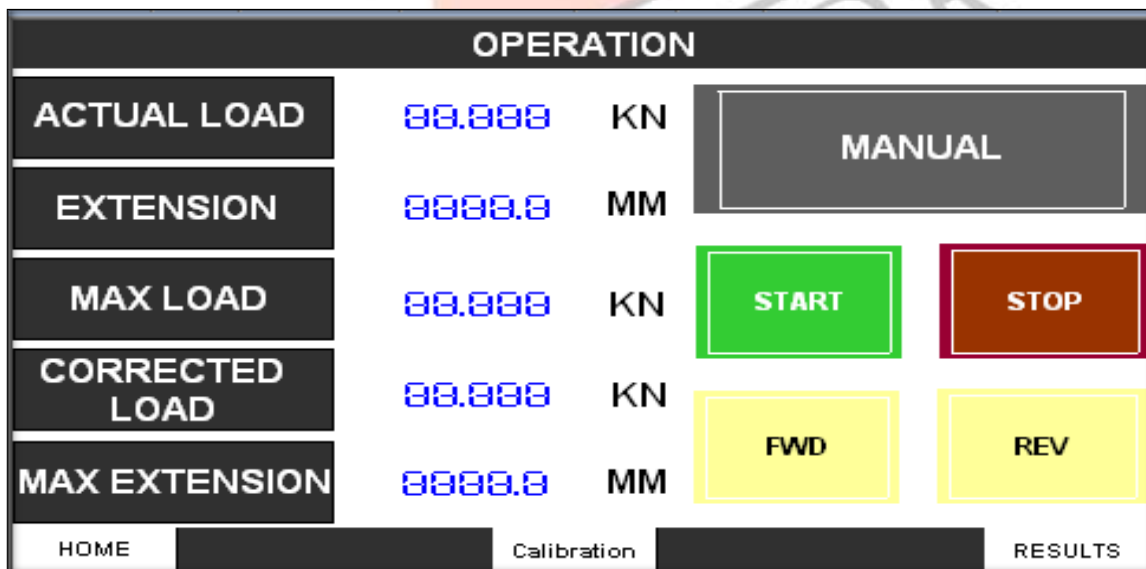


Figure 7: Main Operating Window

Calibration Window

Below Screen is show the compression testing machine calibration screen. in this screen known mm, known load, dead load, mm limit, load limit button are there. Tare button is used for the Make the Value of 0000. Load calibration button is used for calibrating the specific load Value. Extension Calibration button used for other sensor calibration. In calibration time we measure the Actual Value, and it compare to the standard value. and decide the real output of machine.

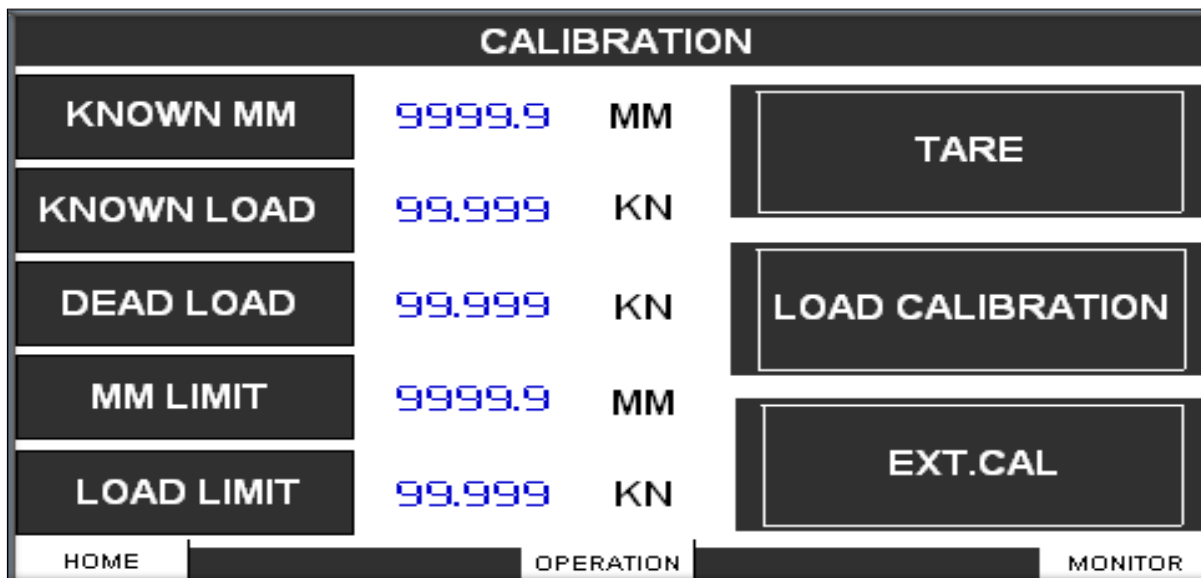


Figure 8: Calibration window

ACKNOWLEDGMENT

The compression testing machine automation is done digitally. Which provide accurate output also compatible with HMI, PLC. All the operation of testing is fully automatic. Also provide human interference by including HMI. we would like to thanks our department for giving us an opportunity to undertaken this project and Paper work. we would also thankful to our project guide Prof. Ashish G. patel for his valuable time and knowledge. We would also thankful of all professors of IC Department who directly or indirectly helped us during the project period. As a project at Shaktikrupa Automation, Ahmadabad, first I would like to thanks to Mr. Jayesh Parmar for giving us a permission to carry out our project work and make a paper Work.

BIOGRAPHIES



Rokad Dhara has received her Bachelor of Engineering with Instrumentation & Control Engineering from Government Engineering College, Rajkot, Gujarat Technological University, Ahmadabad, and Gujarat, India. Her areas of interests include industrial instrument controlling, Biomedical Instrumentation, and automation system, robotics application.



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Jayesh Parmar received his Bachelor of Engineering with Instrumentation & Control Engineering from LD College of Engineering, Ahemdabad in 2011 and Master of Engineering with Instrumentation and Control Engineering from Dharmsinh Desai University, Nadiad in 2013. He has 2.5 year industrial experience. His area of interest in the various fields of instrumentation like automation based machinery, Plc and Hmi based system, programming in labview, Make control panels of electrical and automation based

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