

ME372

METROLOGY LAB

EXPERIMENT - 6

Coordinate Measuring Machines

— Group 33C —

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Exp 6 - CMM (Coordinate Measuring) Machine

Aim: To study the functioning of CNC coordinate measuring machine and perform measurement using this machine.

Theory: CMMs are built rigidly and are very precise. They are equipped with digital readout or can be linked to computers for online inspection. They are made more rugged to resist environmental effects.

Important features:

- ① To give max^m rigidity to machines without excessive weight.
- ② Map of systematic errors in machine is built up and fed into computers, so that error compensation is built up into software.
- ③ All machines are provided with their own computers with interactive dialogue facility.

• Main Elements:

- ① Main Structure
- ② Probing System
- ③ Machine Control & Computer Hardware
- ④ Software for 3-D geometry analysis

• Advantages:

- ① Flexibility
- ② Reduced Setup time
- ③ Single Setup
- ④ Improved Accuracy
- ⑤ Reduced Operator Influence
- ⑥ Improved productivity

INTRODUCTION

- A coordinate measuring machine is an electromechanical system designed to perform coordinate metrology
- Coordinate metrology is concerned with the measurement of the actual shape & dimensions of an object and comparing these with the desired shape and dimensions
- It consists of the evaluation of the location, orientation, dimensions & geometry of the part or object

TYPES OF COORDINATE MEASURING MACHINES

(1) Bridge CMM

- Most widely used
- Consist of contact probe & 3-axis movement mechanism
- Reduces bending effect

(2) Cantilever CMM

- Used for measuring small parts, providing access on 3 sides
- Head is attached to one side of the rigid base
- It has high level of accuracy & low meas. uncertainty

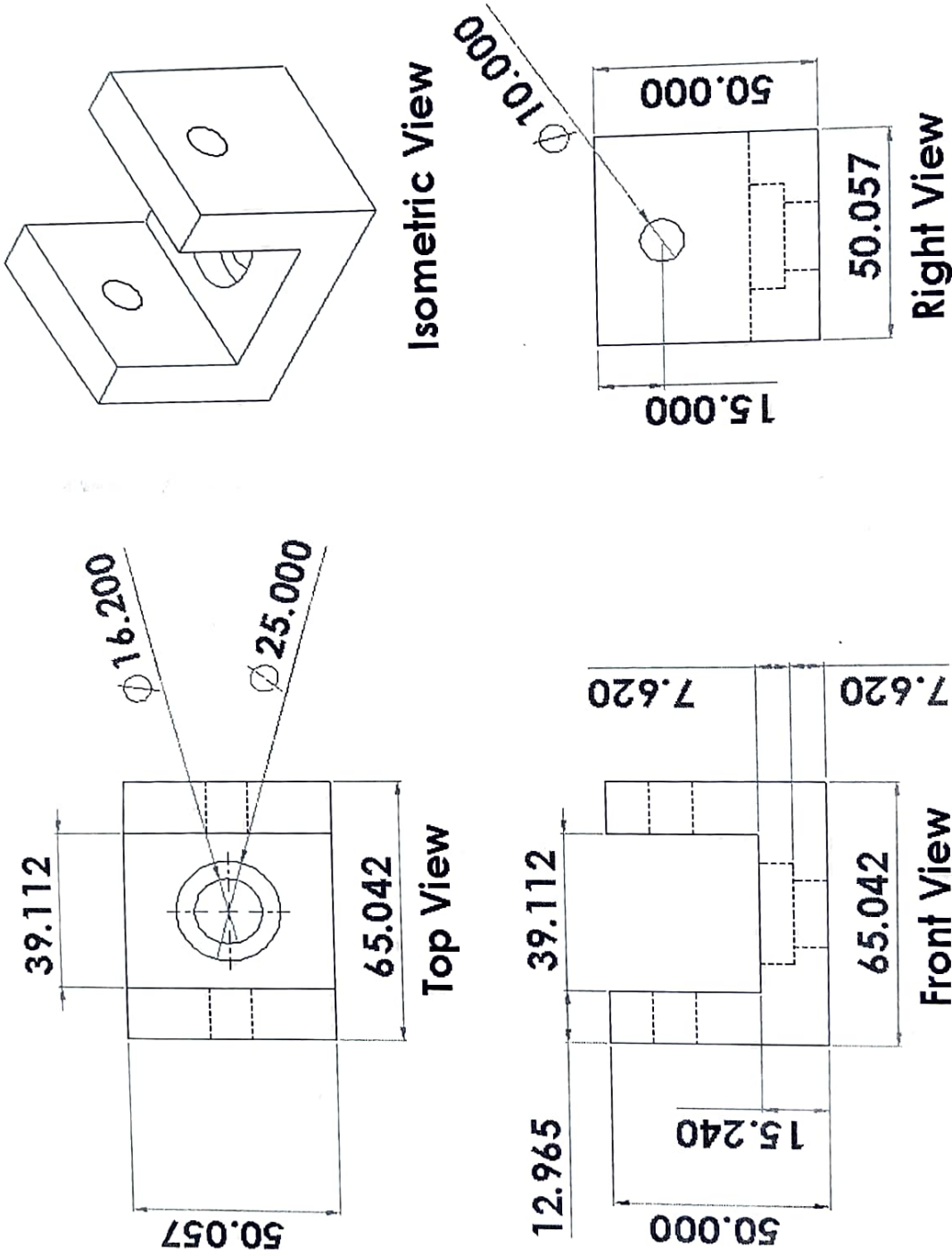
(3) Gantry CMM

- Similar to Bridge CMMs but larger in size
- It has bridges raised on pillars increasing the measuring volume
- Used for very large pieces e.g. aerospace industry

(4) Horizontal arm CMM

- aka layout machine
- It provides a large, unobstructed work area
- Ideal configuration for meas. of automobile parts

ME370: S3-C: SOLIDWORKS Model from CMM Measurements



Note that the dimensions for the side holes were not specified in the data, and hence appropriate dimensions were assumed for the sake of modelling

All dimensions are in [mm].