SNS COLLEGE OF TECHNOLOGY

Kurumbapalayam (Po), Coimbatore – 641 107

An Autonomous Institution

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A+' Grade

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE NAME : 16MEOE2 NEW PRODUCT DEVELOPMENT

III YEAR /V SEMESTER

Unit 3 – Concept Embodiment And Modeling Of Product Metrices

Topic : MECHANICAL EMBODIMENT PRINCIPLES

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Mechanical Embodiment Principles

During the conceptual design phase, the **mechanical** design engineer develops new ideas, new **principles** of solution based on physical **principles** and evaluate their feasibility.

Once an idea (a concept) has been chosen, the product architecture and product part development starts.

- **Alignment of forces**
- **3-2-1 Alignment**
- **Deflection reduction and Abbe principle**
- **Forces in members**
- **Vibration reduction.**

Alignment of forces

- Forces within an assembly are what makes parts move.
- The position and orientation of these forces are design choices that designer makes.
- To properly design the product, one should consider three forces on moving part.

Weight

Frictional force

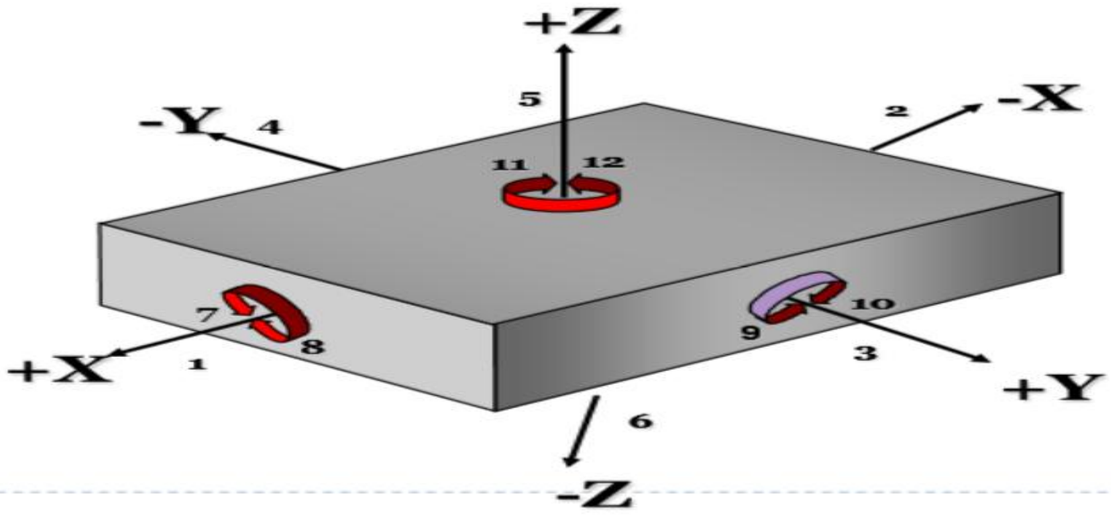
Applied force

3-2-1 Alignment

Basics of Fixture Design

12 Degrees Of Freedom

(1) X+
(2) X-
(3) Y+
(4) Y-
(5) Z+
(6) Z-
(7) XCCW
(8) XCW
(9) YCCW
(10) YCW
(11) ZCW
(12) ZCCW



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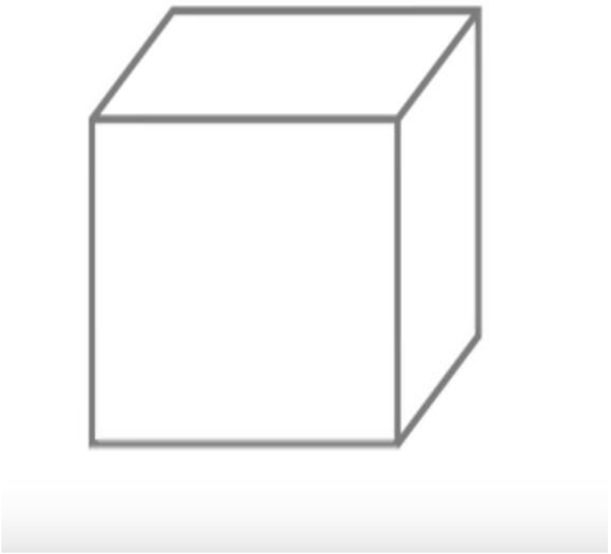
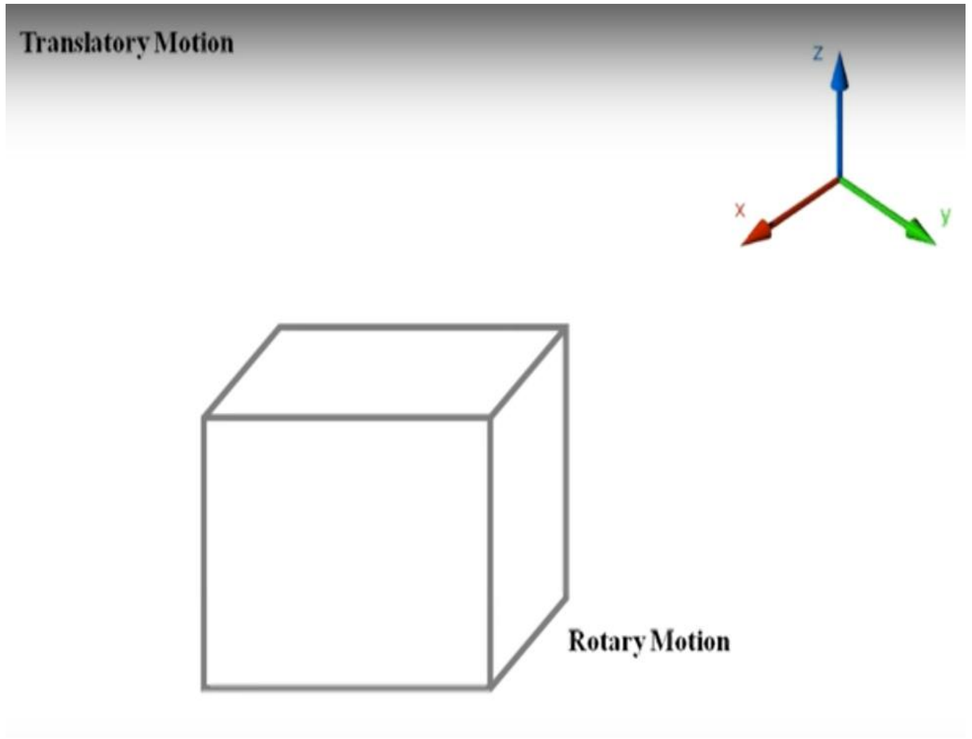
Major functions required for proper design

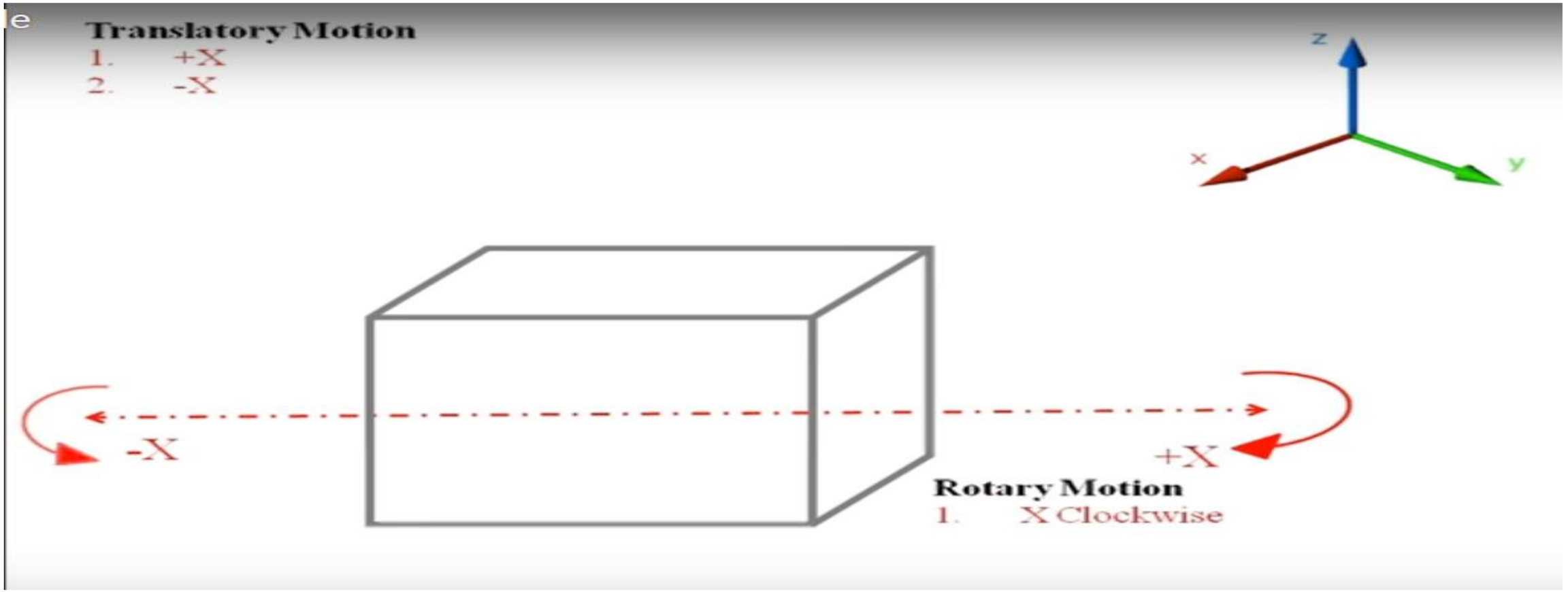
- **Location**
- **Supporting**
- **Clamping of blank**

3-2-1 Alignment

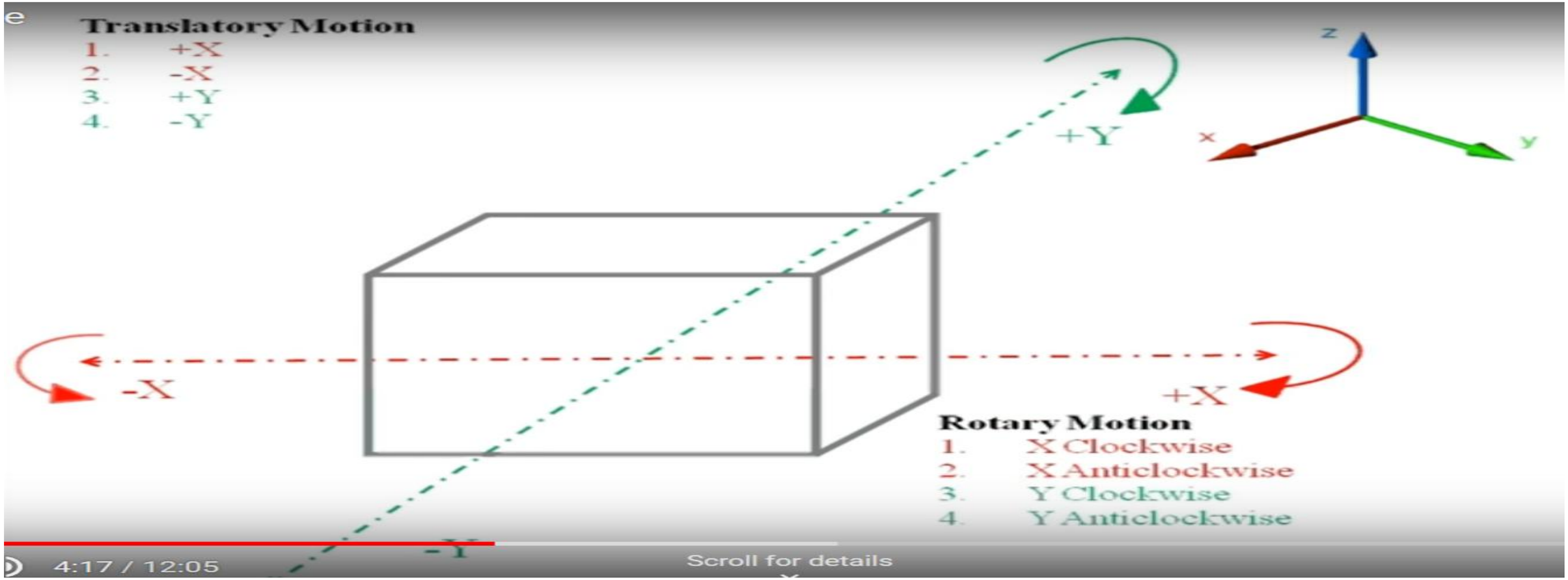




3-2-1 Alignment



3-2-1 Alignment



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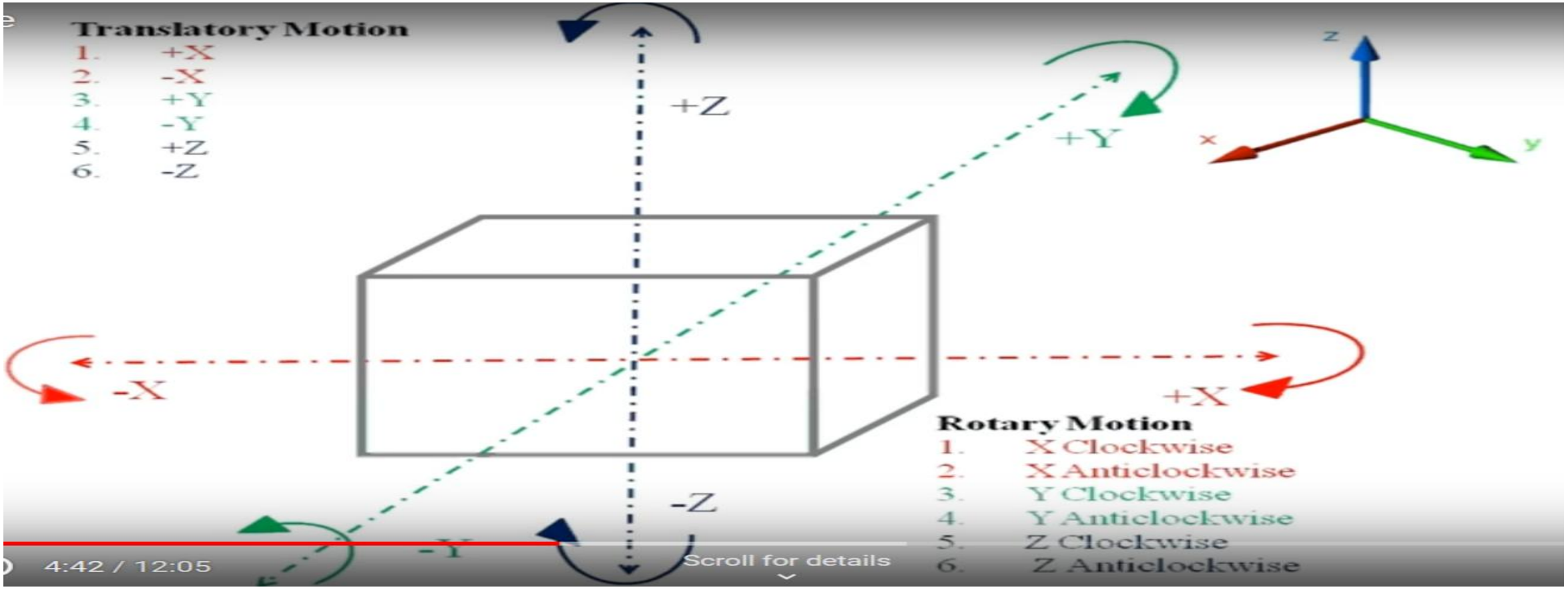

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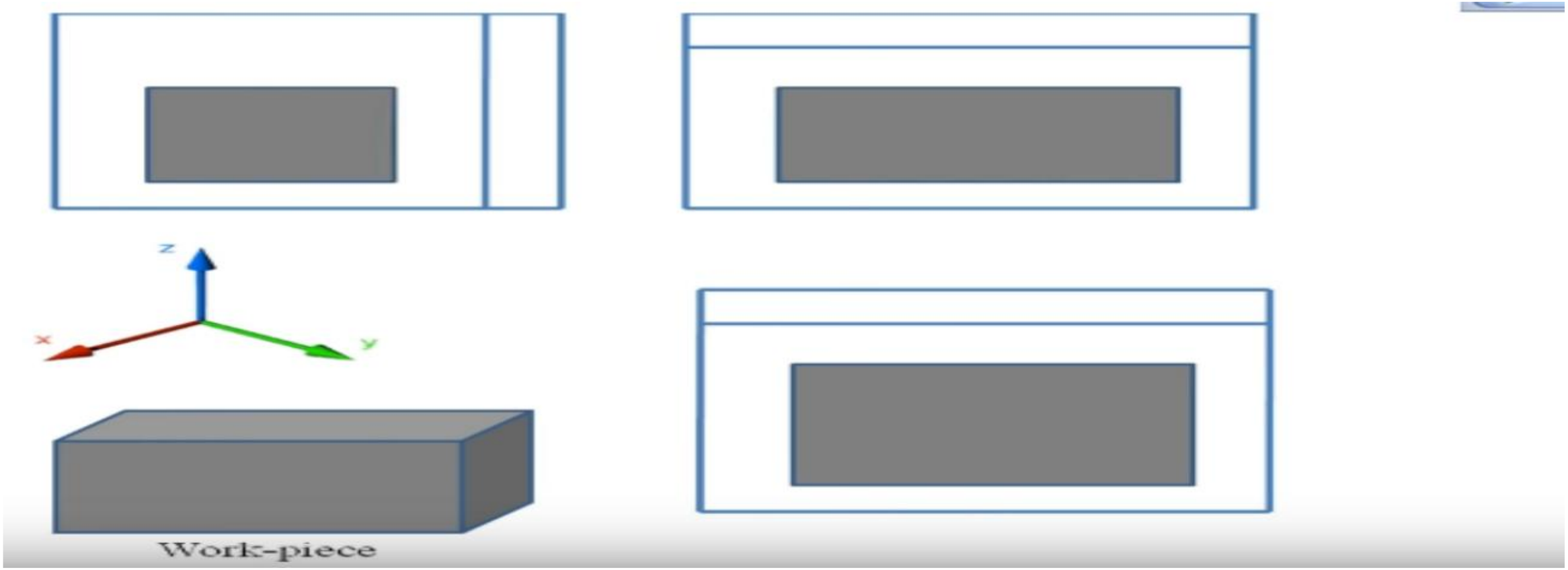
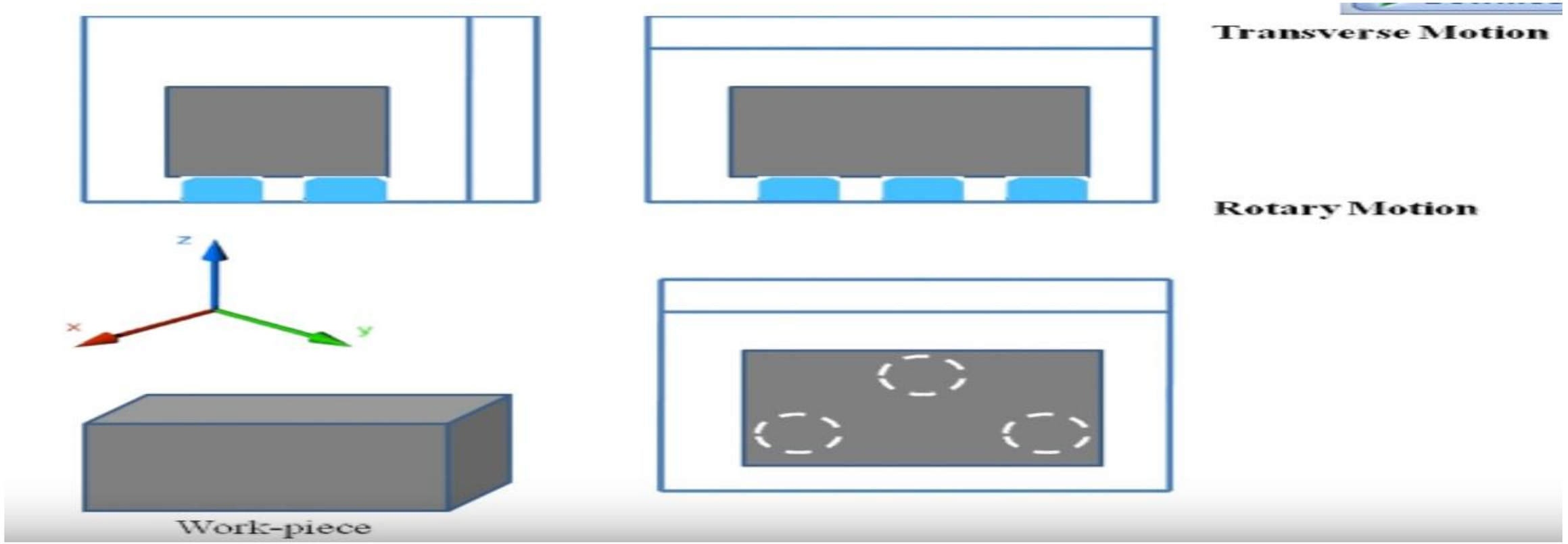
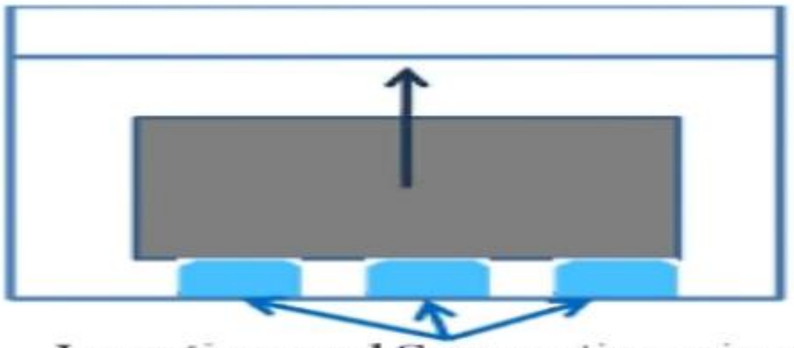


3-2-1 Alignment

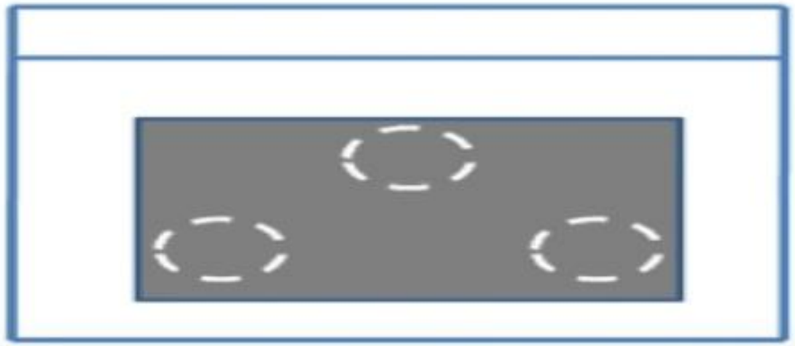


3-2-1 Alignment

Work-piece



Locating and Supporting pins

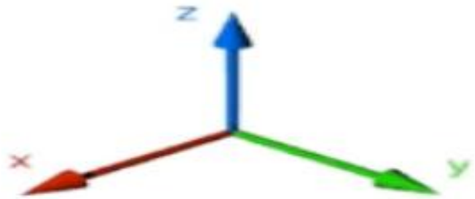


Transverse Moti

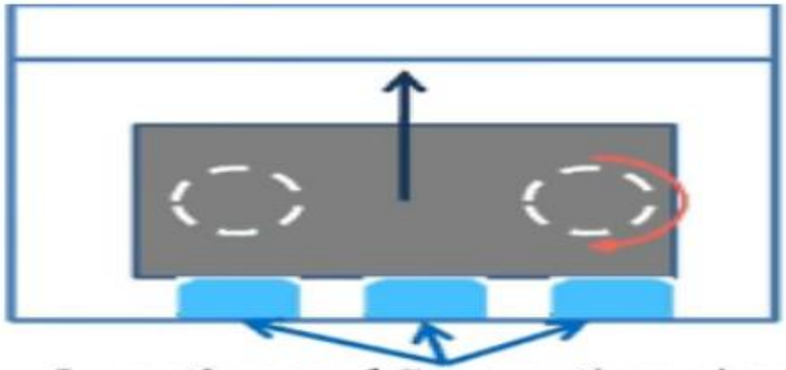
6. -Z

Rotary Motion

3-2-1 Alignment



Work-piece



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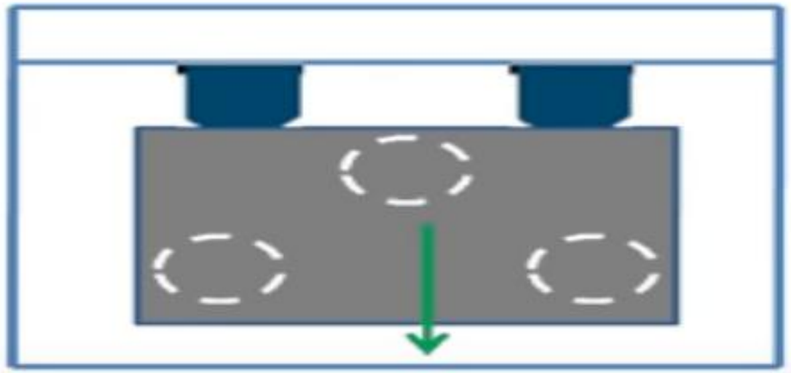


Transverse Motion

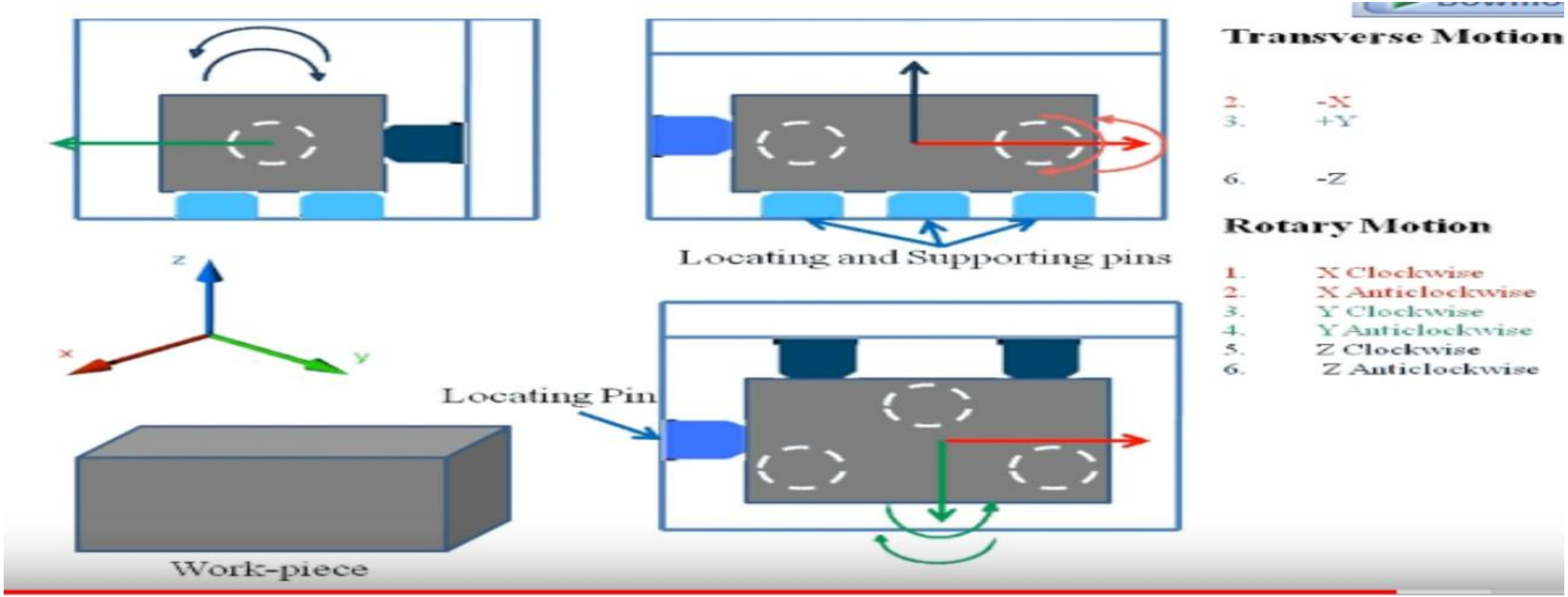
3. +Y

6. -Z

Rotary Motion

1. X Clockwise
2. X Anticl

3-2-1 Alignment



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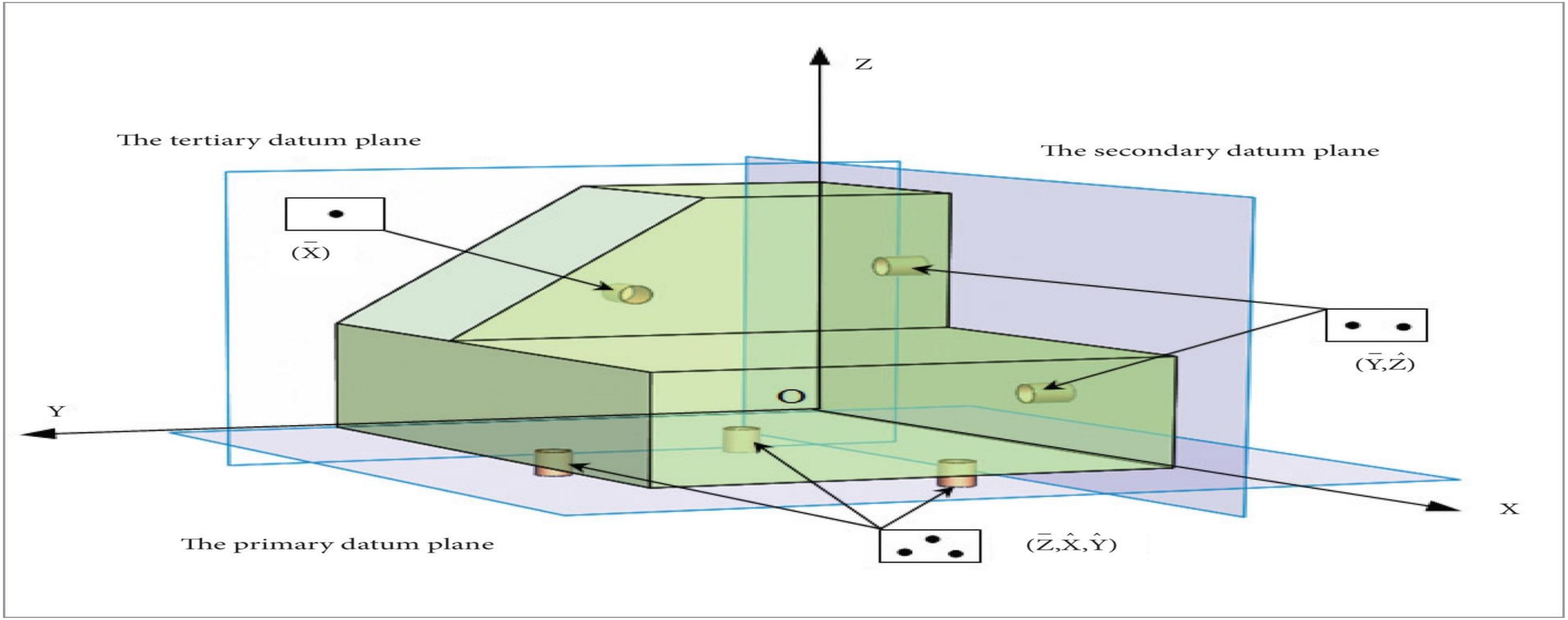

Practise quiz

1.Principle of _____ states that “In order to achieve the maximum accuracy in location the locating points should, therefore, be placed as far apart from one another as it is possible”.

(A) Six point location
(B) Least points
(C) Extreme positions
(D) Mutually perpendicular planes

2.When 3-2-1 principle is used to support and locate a three dimensional work-piece during machining, the number of degrees of freedom that are restricted is

A. 7
B. 8
C. 9
D. 10

Ans: 1-C, 2.C

Vibration reduction

Three approaches to vibrate less

- First approach : ***Reduce the source***
- Second approach: **Change the natural frequency of source or transmitting parts**
- Third approach : **Insertion of dampeners**