Mechanics and Machines, Lecture 7

Links, Joints, Connections

Shafts, Axles, Shafts couplings

Bearings

Innopolis University

Mechanism

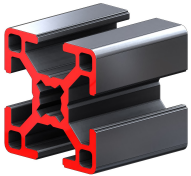
What does the mechanism consist of?

- Links
- Joints
- Connections: permanent and detachable

Links

Types (my classification)

Sheet (Листовой материал): plywood (фанера)



Profile (профиль): T-slot (Конструкционный профиль)

Beam (Брус): al. bar (ал. брус)

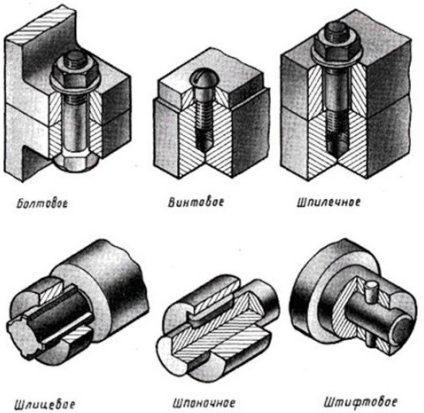
Plate (плита): Aluminum billet (Заготовки)

Joints

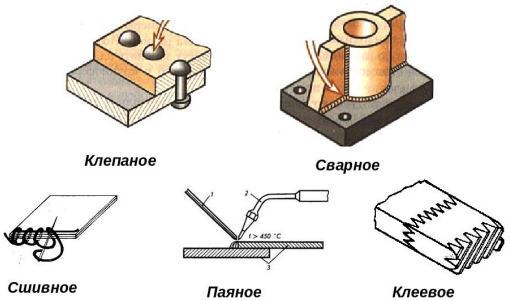
More info in **Lecture 3**

Connections

Classification



Detachable (Разъемные)



Permanent (Неразъемные)

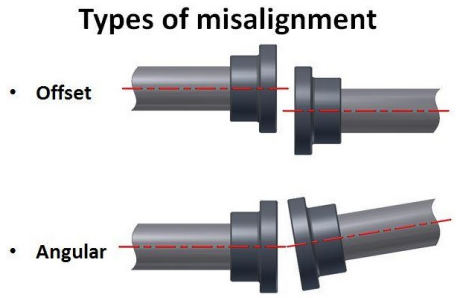
Shaft (Вал), Spindle (Шпиндель), Axle (Ось)

Video

Shaft Coupling

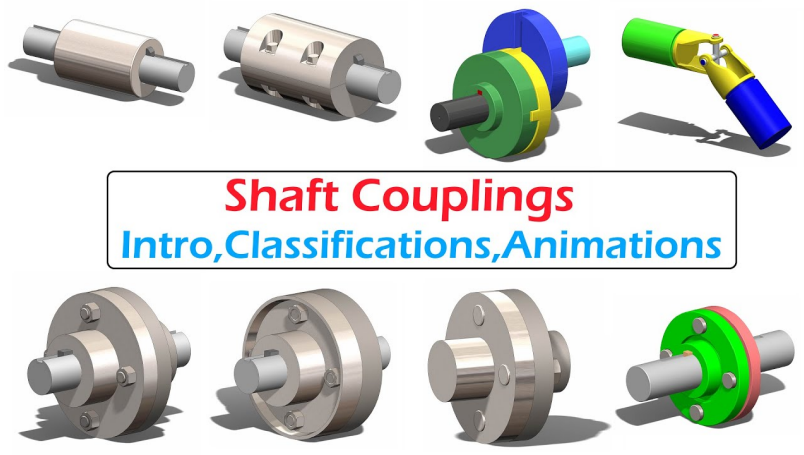
Intro

The shaft coupling is referred to as that mechanical component which is most commonly used for the purpose of *connecting two rotating shafts* like the driving shaft in order to let the driven shaft work for purpose of *transmitting power*.



Shaft Coupling

Video



Types of shaft couplings

Sleeve Coupling

Split-Muff Coupling

Flanged Coupling

Flexible Coupling

Oldham Coupling

Universal Coupling

Gear Coupling

Fluid Coupling

Practical usage of Shaft Couplings

Video

Shafts + Shaft Couplings

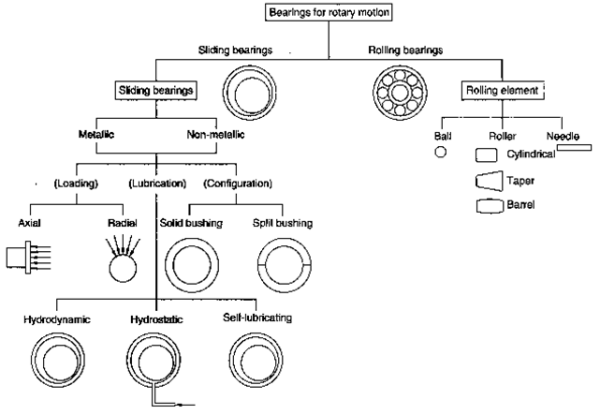
Reference material

- Shafts (video, rus)
- Classification of couplings, Types of couplings, Coupling types (Indian, video)
- Text material about shaft couplings

Bearings

Definition

Bearing is a machine element that *constrains relative motions* and is used to *reduce the friction* between moving parts.



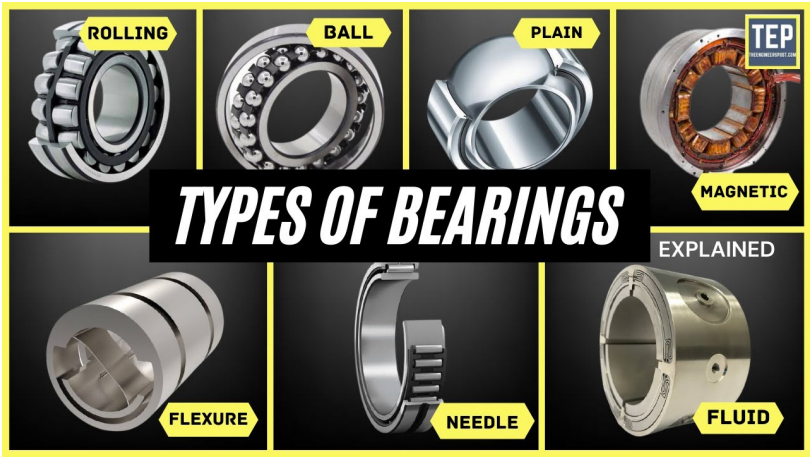
Bearings

What we should cover

- Types, prof and cons
- How to mount and dismount them on shaft
- How to fix it on outer body (Bearing housing)

Rotary Bearings

Video

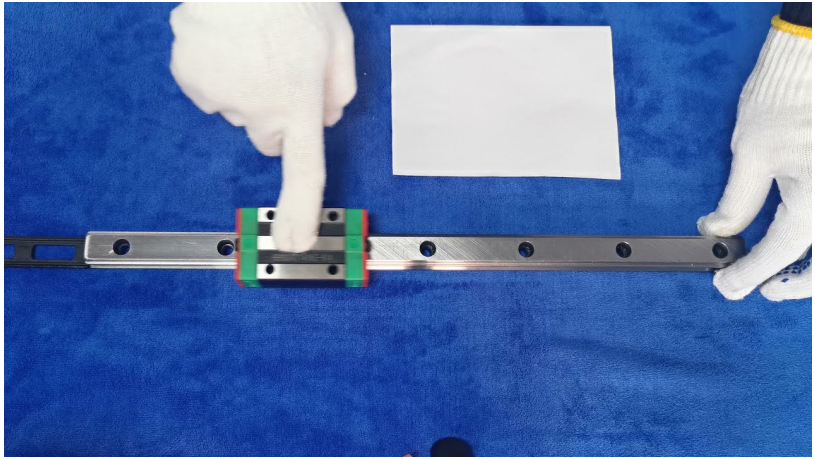


Linear Ball Bearings

Video

Linear Guideway

Video



Types of bearings

Ball Bearing

Roller Bearing

Plain Bearing

Flexure Bearing

Needle Bearing

Linear Bearing

Fluid Bearing

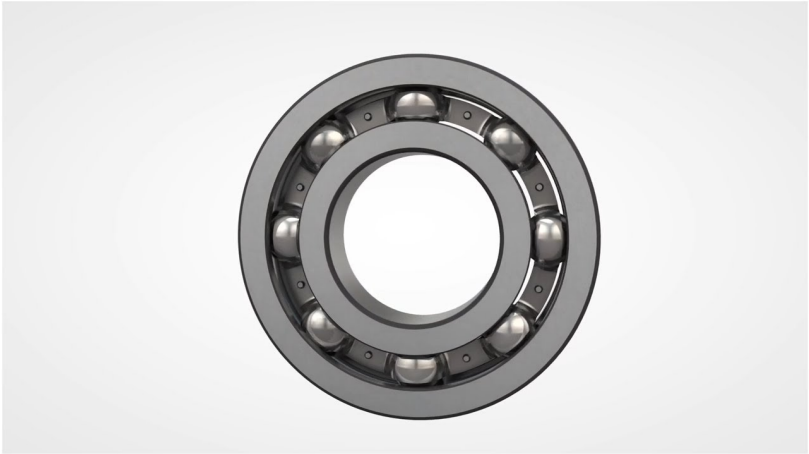
Magnet Bearing

Taper Bearing

Cylinder Bearing

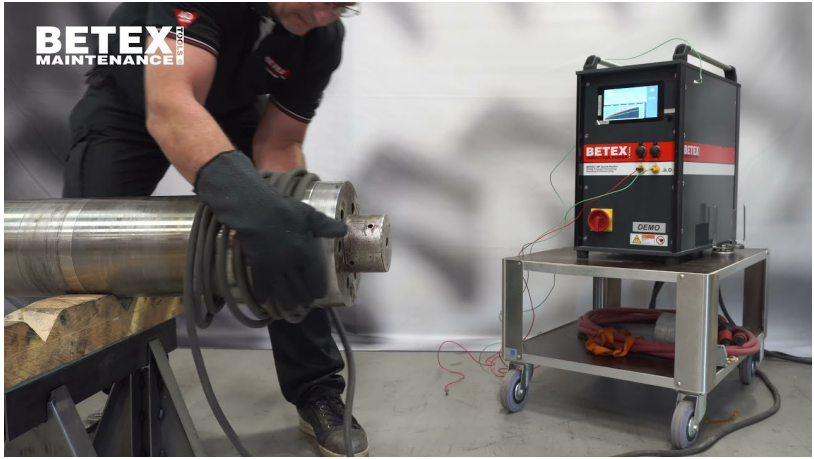
Mounting and dismounting bearings

Video



Hot dismouting bearings

Video



Mounting and dismounting bearings

Depending on the bearing type and size, mechanical (cold), thermal (hot) and hydraulic methods are used for mounting.

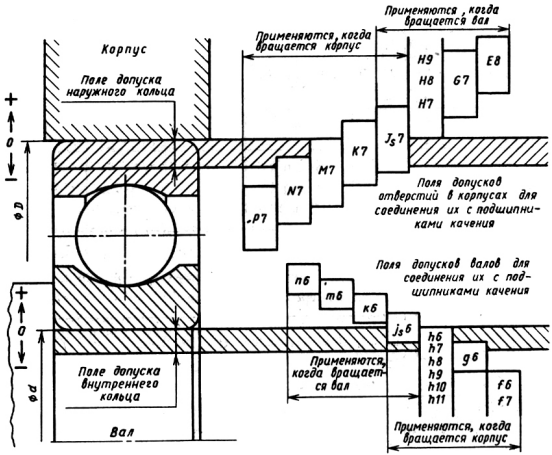
BEARING MOUNTING METHODS OVERVIEW

	Mechanical (cold) mounting	Hot mounting	Hydraulic mounting / oil injection
Bearing size	Small, medium	Small, medium, large	Small, medium, large
Seat type	Cylindrical, tapered, adapter sleeve, withdrawal sleeve	Cylindrical	Tapered, adapter sleeve, withdrawal sleeve
Tools used	Fitting tool, hook spanner, impact spanner	Hot plate induction heater, hot oil bath	Hydraulic nut and pump, drive up method, oil injection method

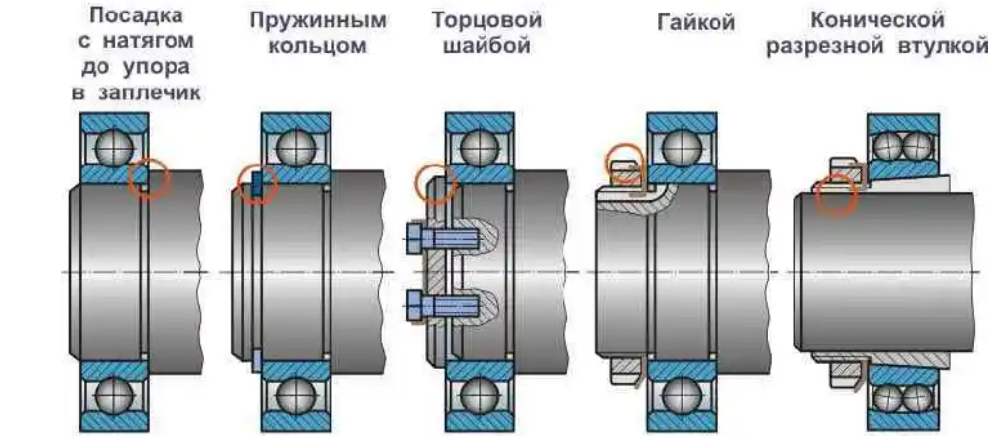
Quality of press-fit surfaces. Rule for selecting tolerances

Video

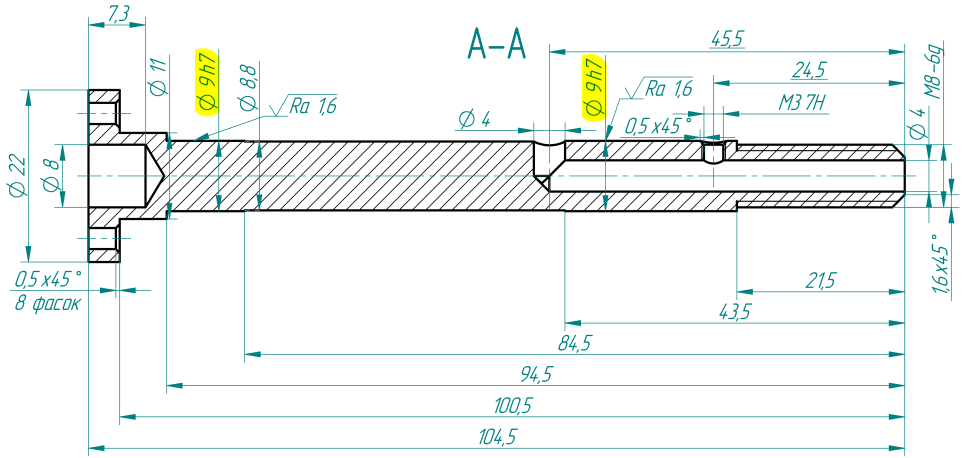
Tolerances for mounting (GOST)



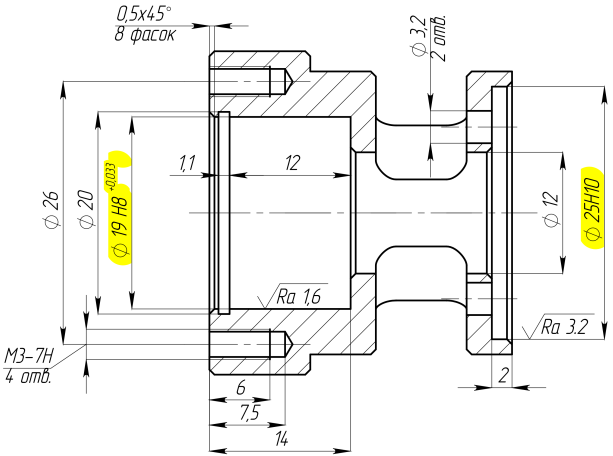
Mounting of roller bearings on shafts



Case Study: HW_CAD_DET2

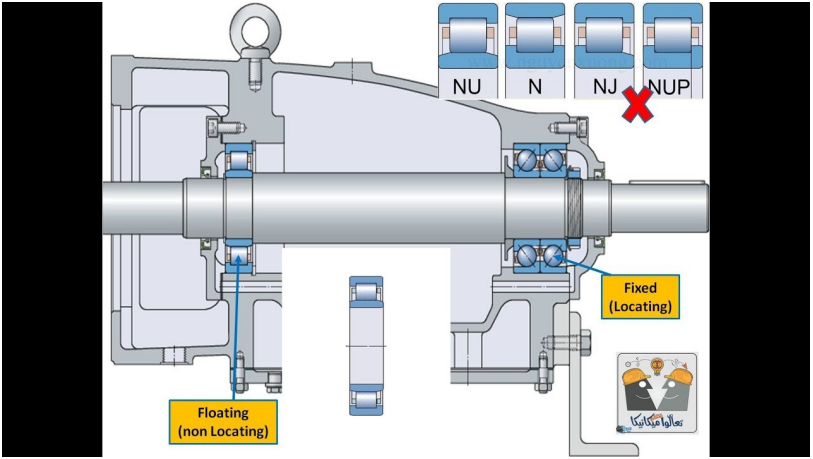


Case Study: Eurobot shaft flange



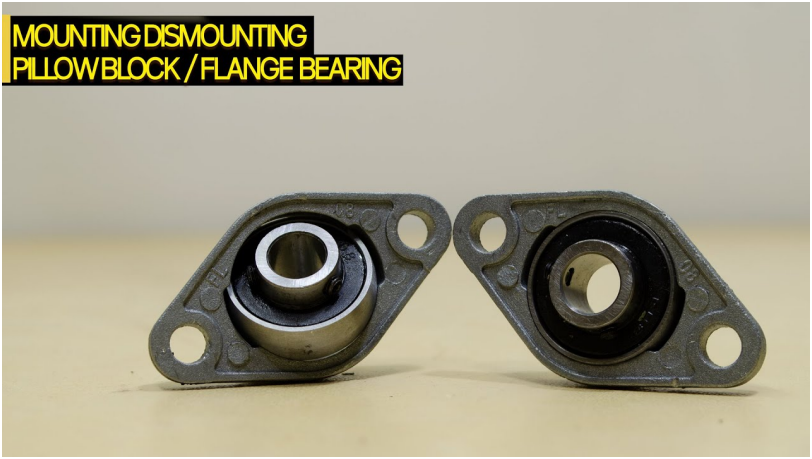
Locating and floating bearings

Video



Pillow Block

Video



Bearings

Reference material

- Site for ordering bearings in Russia
- Bearings (video)
- Linear Guideway Hiwin (video)
- Rolling bearings (video, rus)
- Plain bearings (video, rus)
- Bearing mounting guide
- All info about how to design bearing housing (rus) (recommended)

Reference material

1. List of Basic Mechanical Parts (video)
2. Mott R. L., Vavrek E. M., Wang J. Machine Elements in Mechanical Design, Ed. — 2011
3. Avallone E. A., Baumeister III T., Sadegh A. Marks' standard handbook for mechanical engineers. — McGraw-Hill Education, 2007.
4. Budynas R. G. et al. Shigley's mechanical engineering design. — New York : McGraw-Hill, 2011.
5. A lot of engineering books in english

Deserve “A” grade!

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Room 105 (Underground robotics lab)