

Couplings

A flexible coupling (bellows) makes it possible to

- Correct the alignment between the axes to be coupled**
- To improve the guidance of the axes to be coupled
- To reduce the play between the two axes to be coupled
- To reduce the inertia of the transmission
- None of the other proposals

Choice transmission

For the realization of a machine tool axis of 400mm, you recommend a transmission:

- with a rigid belt TCH-XX
- with a screw-nut transmission**
- with rack-pinions
- None of the other proposals

Choice of transmission

For the implementation of the axes of a machine of laser cutting of 2mX3m, it is preferable to use:

- A belt
- Screw transmission
- Rack-pinion transmission**
- Crank transmission
- Cable transmission

Direct drive

A direct drive (DD) axis (direct actuation) is a motorized axis without reducer. Check the correct answer(s)

- A DD is more sensitive to external disturbances**
- A solution with DD axes induces more mechanical noise and requires lubrication
- The absence of a reduction gear induces better mechanical reliability.**
- The absence of a reducer makes the system more fragile.
- A DD solution has a better natural frequency (better means higher)**

Recirculating Ball guideways

The balls of a recirculating ball guide

- reduce friction**
- improve rigidity**
- reduce manufacturing costs
- make the implementation more compact**

Guideways

For the implementation of a linear guide with a small stroke (<10 mm) and without backlash, it is preferable to use:

- A guide with flexible blades (flexible hinges' guideway)**
- A guide with ball bearings
- An Igus dry guide
- A Hydrostatic guide
- None of the other proposals

Backlash

Consider a planetary gearbox with 1 degree of mechanical backlash, controlling a 300 mm long arm- The backlash at the tip of the arm is approximately:

- 5 mm**
- 1.67 mm
- 300 microns
- 10 mm

Materials

To improve the eigen frequency of an arm, it is preferable to choose

- An aluminum alloy
- A steel alloy
- A Magnesium alloy
- A Titanium alloy
- The choice is not decisive**

Reducers

For the implementation of a rotary axis **without backlash**, it is recommended to use:

- a Harmonic Drive reducer, if the reduction ratio is low, by low we mean <300**
- a Harmonic Drive reducer, if the reduction ratio is high
- a belt reducer, if the reduction ratio is low
- a belt reducer, if the reduction ratio is high

Spring

A spring mechanism is recommended in a screw transmission to

- reduce the mechanical play in the transmission**
- reduce the friction in the transmission
- increase the natural frequency of the mechanism
- make the system oscillatory

Spring

The use of a preload spring induces the following behavior(s)

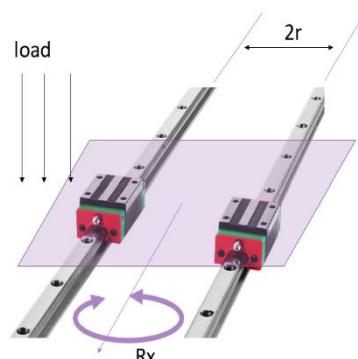
- It increases the friction in the mechanism**
- It reduces the friction in the mechanism
- It reduces the mechanical backlash in the mechanism**
- It makes the mechanism simpler

Rigidity - guideways

Given the construction of a guide with double linear rails, distant by $(2r)$

The torsional stiffness (in the Rx direction) is then:

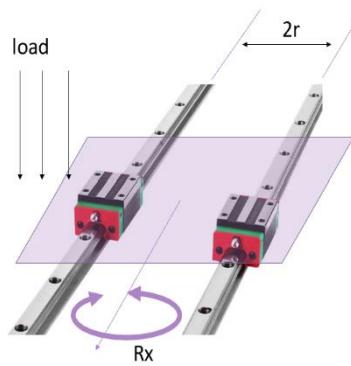
- Proportional to r^2**
- Proportional to r
- inversely proportional to r^2
- inversely proportional to r



Rigidity - guideways

Given the construction of a guide with double linear rails, distant by (2 r)

This construction has the following characteristics:



- Allows better torsional rigidity in the Rx axis**
- Allows better rigidity in the vertical direction**
- Allows better torsional rigidity in the axis Rx but weakens the stiffness in the direction of the load.
- Allows better rigidity in the direction of the load but weakens the torsional rigidity in the Rx axis
- Is hyperguided**

Cable transmission

A cable transmission is recommended in the implementation of haptic devices because of

- its very good mechanical performance (efficiency)**
- its very good reversibility**
- its very low friction**
- its very compact implementation
- The stiffness of the cable

Belt transmission

A belt transmission is recommended in the case of:

- Rapid movements**
- Precise movements
- movements requiring great forces

rack-and-pinion

A rack-pinion transmission is recommended for:

- rapid movements**
- precise movements (because of the stiffness of rack pinions transmissions (at the condition that the back lash is well compensated))**
- movements requiring great forces

Exam- questions- English

screw

A Screw transmission is recommended for:

- rapid movements
- precise movements (at the condition that the back lash is well compensated)**
- movements requiring great forces**

Ball screws

The Balls of a ball screw transmissions allow to:

- Reduce the manufacturing cost
- Improve the compactness of the screw
- Reduce the friction**
- Improves mechanical reversibility**
- None of the other proposals.

Biocompatible materials

Stainless steel is biocompatible

- True
- False**

Quality factor

Quality factor introduced by Dr. Marc Olivier Demaurex makes it possible to compare the performance of robots regardless of their size.

- True**
- False

Ball guideways

The balls of a recirculating ball guide reduce friction.

- True**
- False

Exam- questions- English

Materials

For the construction of a rigid arm, a steel alloy is preferable to an aluminum alloy

- True
- False

Precision

The higher the natural frequency, the better the positioning precision of a robot arm .

- True
- False

Precision

For reducing the positioning error of a robot arm, a bang-bang acceleration profile is better than a sinusoidal acceleration profile

- True
- False

Reducers

A planetary gearbox can achieve (implement) higher reduction ratios than a Harmonic Drive

- True
- False

Reducers

A Harmonic Drive reducer is more rigid than a planetary reducer

- True
- False

Springs

A spring is recommended to dampen oscillatory behavior,

- True
- False

Trajectories

The profile acceleration has no effect on the position accuracy of a robot arm.

True

False

Cable transmissions

A cable transmission is recommended in the implementation of haptic devices

True

False

Cable transmissions

Cable and belt transmissions have comparable efficiencies

True

False

Ball screws

Ball screw transmissions are chosen because of their lower manufacturing cost

True

False