

Third School Year

## SHAFT CONNECTIONS

**Shaft connections** transfer the **torsion** moment between the driving and driven **shaft**, or between individual machine parts or mechanisms. The **clutch** consists of driving, driven and connecting parts. Between the connecting parts there are **screws**, **pins**, **springs** or liquids.

This connection transfers the **torsion** moment without changes in the sense of rotation and even the rotation.

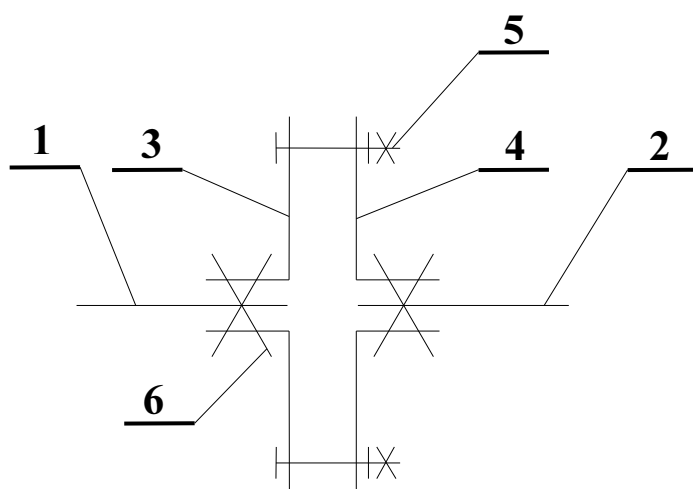
### Function of the **clutch**

- it protects equipment against **overload**
- it limits the maximum **torsion** moment
- it reduces impacts and the shaft **torsional** vibrations
- it ensures the continuous running of equipment
- it enables the balancing of assembly **inaccuracies** – that is non-axiality, **shaft** axial **displacement**
- it enables the balancing of the thermal **expansivity** of connecting parts

### Clutch classification according to the transfer moment:

- 1) mechanically uncontrolled **clutches**
- 2) mechanically controlled **clutches**
- 3) hydraulic **clutches**
- 4) electric **clutches**
- 5) magnetic **clutches**

### Basic diagram and description of **clutches**



Position description:

- 1 driving **shaft**
- 2 driven **shaft**
- 3 driving disk
- 4 driven disk
- 5 connecting unit
- 6 **shaft connection** with **hub**

### **Clutch classification of mechanically uncontrolled clutches**

They can be:

- **Non-flexible clutches**  
The most used is a fixed disk clutch. They are also *sleeve clutches* and *split coupling clutches*.
- **Flexible clutches**  
The most often used is a disk *pin-flexible clutch*. They are also with a *screw spring* or with a *hose spring* – BIBI. Another *clutch* is a *grinding clutch* – PERIFLEX.

**Flexible clutches** have more uses than non-flexible *clutches*. While running and reducing impacts, they enable the balancing of assembly *inaccuracies* and of axial *shaft* feed. They are easy to assemble and disassemble.

### **Clutch classification of mechanically controlled clutches**

They can be:

- **Loose clutches**  
With form contact (for example a *claw clutch* which has variously formed teeth), with force contact (for example friction *clutches* which can be *frontal*, *tapered* or *multiple-disk*).
- **Overload release clutches**  
For example with a *shear pin*, or a *ball clutch*.
- **Idle clutches**  
For example an *overrunning clutch*.
- **Starting clutch**  
For example a *clutch* with friction segments.

Mechanically controlled *clutches* enable the disconnection of *shafts* during operation.

### **Clutches calculation**

The size of a *clutch* is determined from the calculated moment of  $M_v$ . **Clutches** with the closest, highest *allowable* moment are then selected from producers catalogues. The operational co-ordinate is determined by the norms of ČSN (Czech Norms and Standards).

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**VOCABULARY**

<b>allowable</b>	přípustný
<b>ball clutch</b>	kuličková spojka
<b>claw clutch</b>	zubová spojka
<b>clutch</b>	spojka
<b>displacement</b>	vychýlení
<b>expansivity</b>	roztážnost, rozpínavost
<b>flexible</b>	pružný
<b>frontal</b>	čelní
<b>grinding clutch</b>	obručová spojka
<b>hose spring</b>	hadicová pružina
<b>hub</b>	náboj
<b>idle clutch</b>	volnoběžná spojka
<b>inaccuracy</b>	nepřesnost
<b>loose clutch</b>	výsuvná spojka
<b>multiple-disk</b>	lamelový
<b>non-flexible</b>	nepružný
<b>overload</b>	přetížení
<b>overload release clutch</b>	pojistná spojka
<b>overrunning</b>	volnoběh
<b>pin</b>	čep
<b>screw</b>	šroub
<b>shaft</b>	hřídel
<b>shaft connection</b>	hřídelové spojení
<b>shear</b>	střižný
<b>sleeve clutch</b>	trubková spojka
<b>split coupling clutch</b>	korýtková spojka
<b>spring</b>	pružina, pero
<b>starting clutch</b>	rozběhová spojka
<b>tapered</b>	kuželový
<b>torsion</b>	krut, kroucení
<b>torsional</b>	kroutící

**COMPREHENSION QUESTIONS**

1. What do shaft connections transfer?
2. Can you name the function of a clutch?
3. How do we classify clutches according to the transfer moment?
4. What is the difference between a non-flexible and a flexible clutch?
5. How do we calculate clutches?

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### EXERCISES

1. What kind of clutch have you learnt from the text:

CLUTCH

2. Double puzzle - Unscramble each of the clue words. Copy the letters in the numbered cells to other cells with the same number.

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CITMAP	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	12
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RECWS	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	6
DEERUC	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	11
RSPIGN	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	1
RIVDIGN	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	8
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### EXERCISES – KEY FOR TEACHERS

1. viz text

#### 2. SHAFT CONNECTION

clutch  
impact  
determine  
flexible  
overload  
pin  
screw  
reduce  
spring  
driving  
vibration  
expansivity