People’s Democratic Republic of Algeria
Ministry of Higher Education and Scientific Research
Abdelhafid BOUSSOUF University of Mila

Institute of Science and Technology
Department of Civil and Hydraulic Engineering

Technical Drawing

Practical Work / 2nd Year Bachelor / Civil and Hydraulic Engineering

Presented by:
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Chapter IV:
CUTS AND SECTIONS

Cuts

1. Principle

Choose a cutting plane according to the message you want to convey, often a plane of symmetry.
Mentally remove the part of the object located on the observer's side.
Represent all shapes located in the cutting plane (using hatching) and those behind it (possibly showing hidden parts).

Note

In general, hidden outlines or short dashed lines are not drawn in section views, unless they are essential for understanding. Hatching highlights the cut parts.

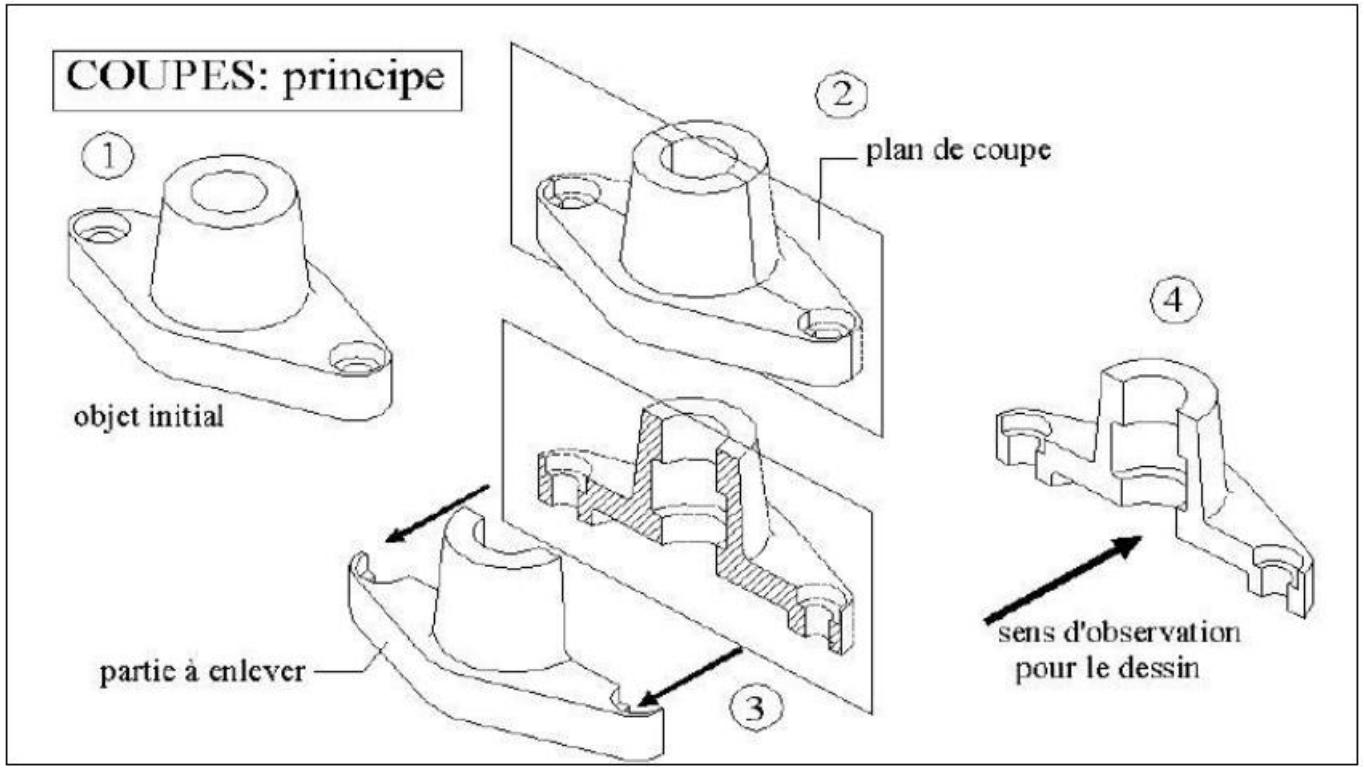


Fig 1. Principle of Cuts

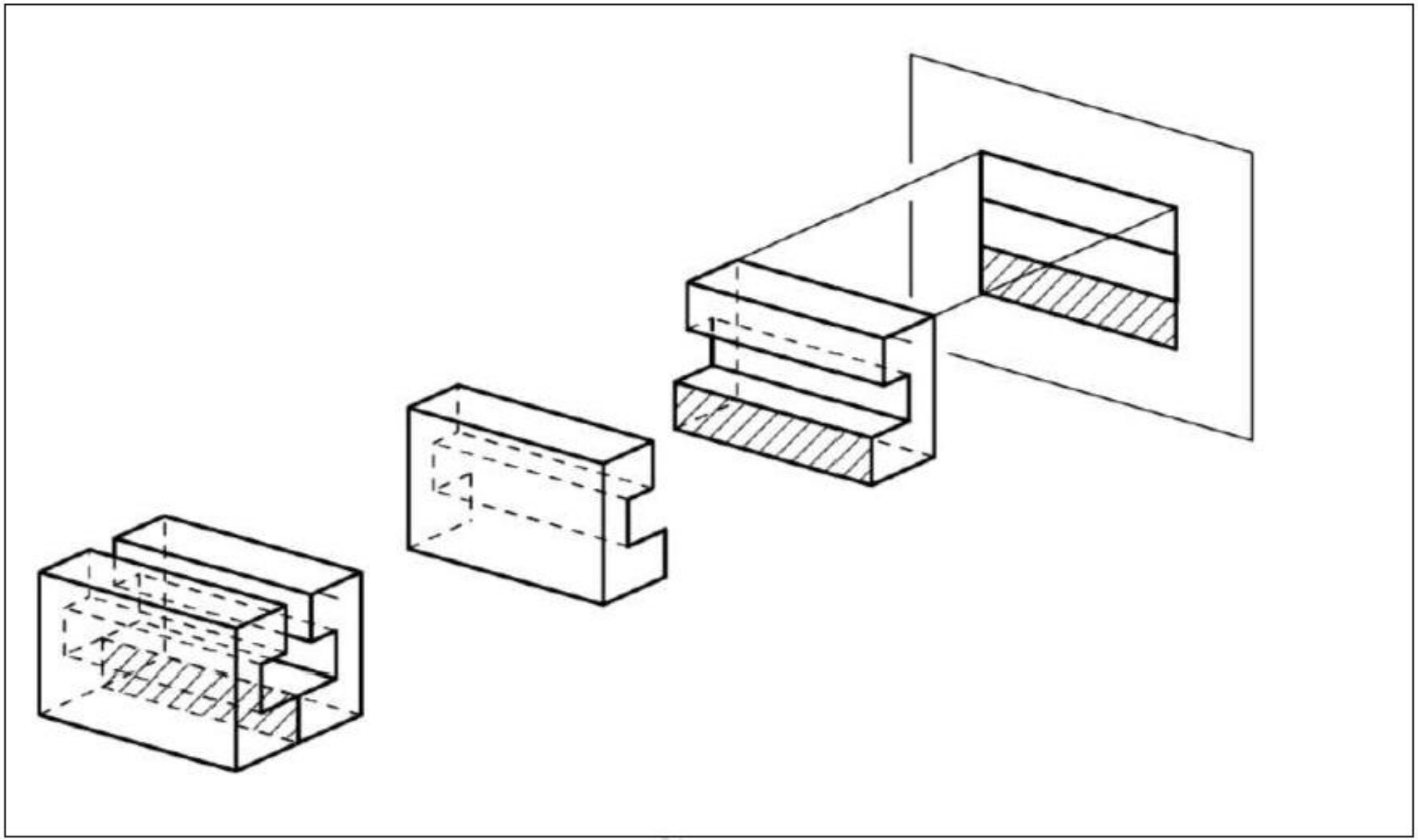


Fig 2. Example of a Cut

2. Standard Representation Rules

Cutting plane: it is indicated in an adjacent view.

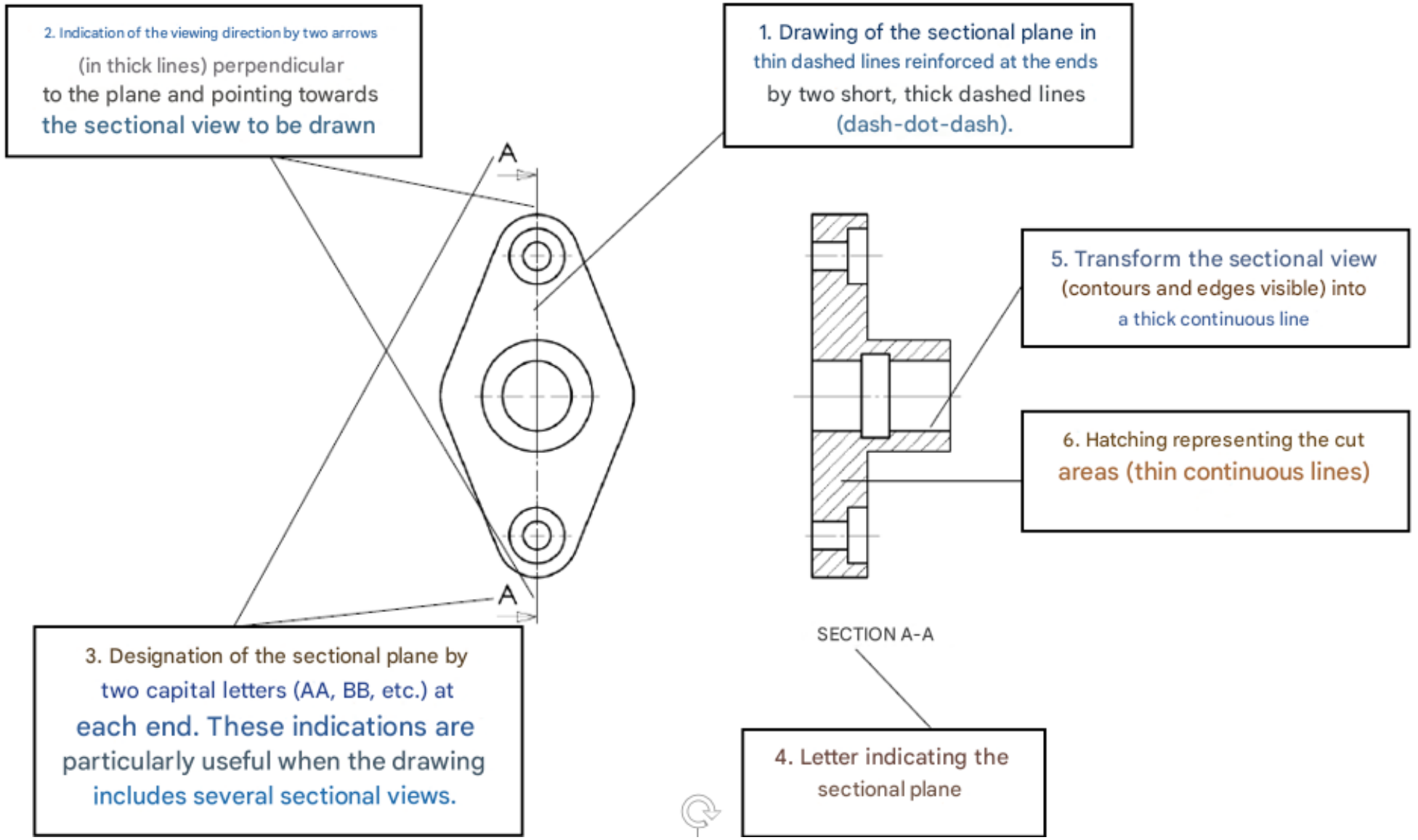


Fig 3. Cutting plane

Hatching

Hatching appears where the material has been cut.
It is drawn with thin continuous lines and preferably inclined at 45° (when only one object is cut) relative to the general contour lines.
The spacing should be regular (1.5–5 mm).
The inclination of the hatching is the same for all parts of the same section of the object.
Hatching never crosses or intersects a thick line.
It never stops on a short dashed line.
The hatching pattern cannot indicate the material of the cut object. However, in the absence of a legend, material families (ferrous, plastics, light alloys, etc.) can be distinguished by commonly used patterns.

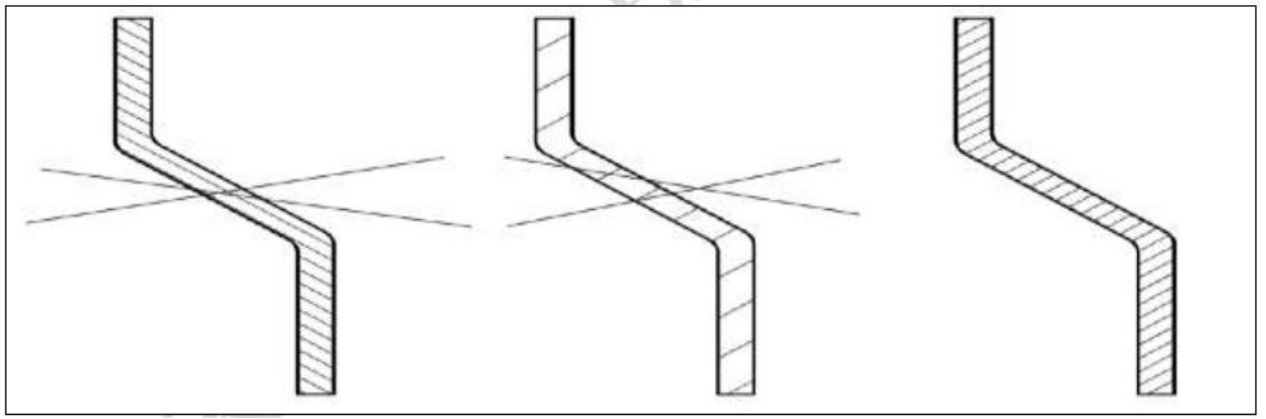


Fig 4. Direction of Hatching

Notes

Ribs are never cut when the cutting plane passes through the plane of their largest surface. The same rule applies to the spokes of pulleys, flywheels, or wheels.

Solid rotational parts (cylindrical or spherical, such as shafts, axles, balls), screws, bolts, nuts, rivets, and keys are never cut.

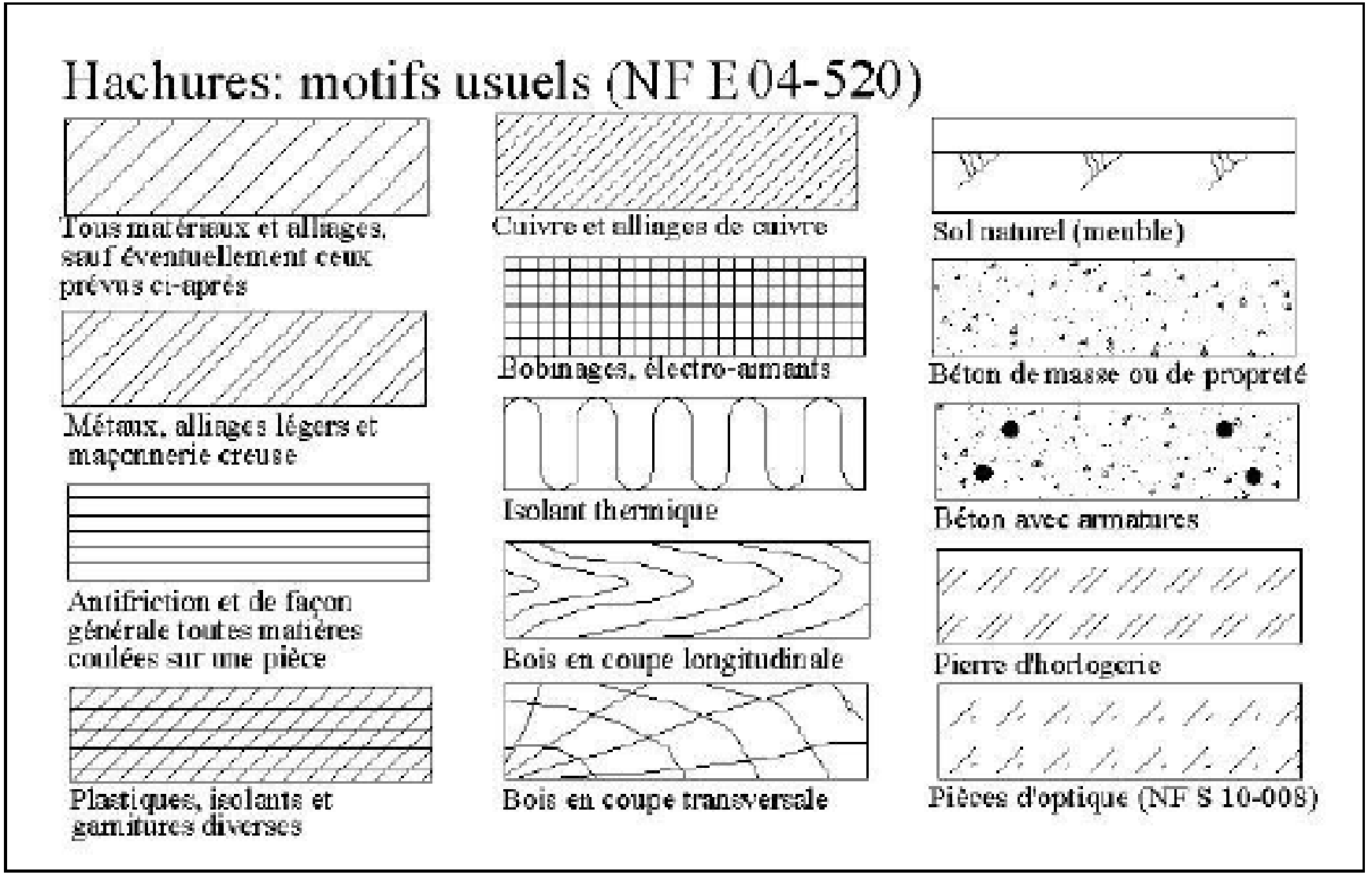
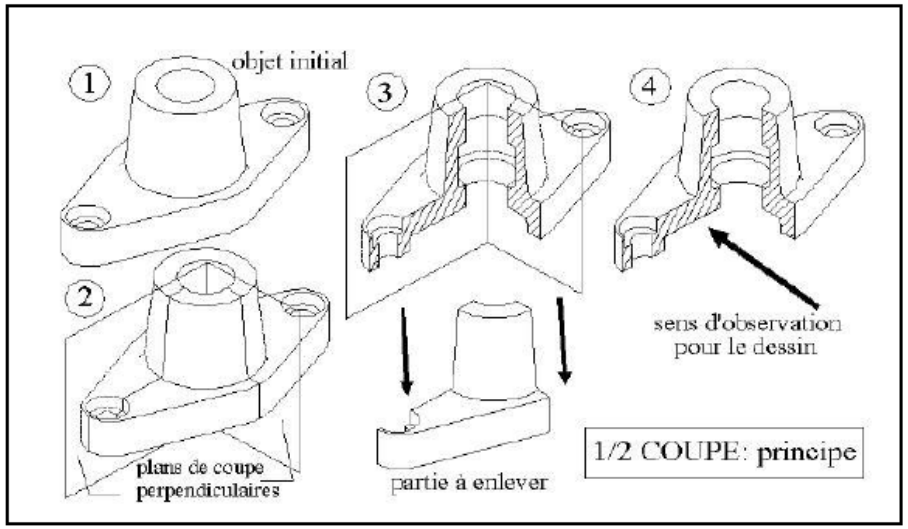


Fig 5. Example of Common Hatching Patterns (NF E04-520)

3. Half Section

Half-section views are particularly useful for symmetrical parts.



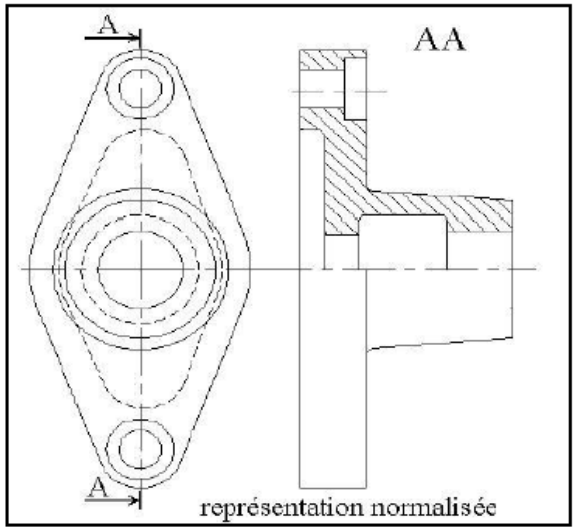


Fig 6. Principle and Standard Representation of a Half Section

In this type of representation, half of the view is drawn in section to show the internal shapes and contours, while the other half remains in the normal view to depict the external shapes and contours.
The rules are the same as for regular sections; the indication of the cutting plane remains unchanged.
The two half-views are always separated by a fine centerline (thin chain line).

4. Local or Partial Section

It is used to show an interesting detail.
The cut area is bounded by a thick continuous line.
Indicating the cutting plane is not necessary in this case.

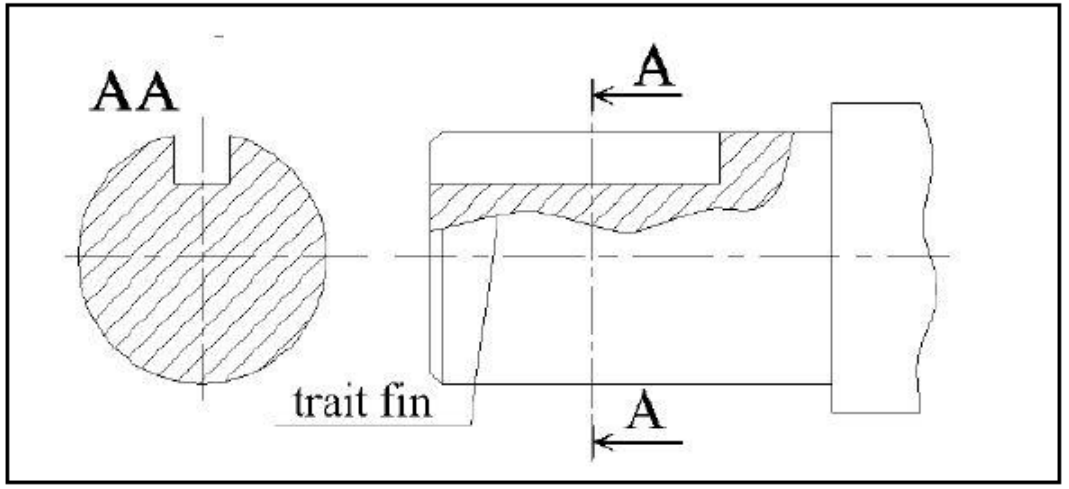


Fig 7. Example of a Local Section

5. Broken Section

If several interesting details of a part are not located on the same plane, instead of making multiple full sections, these sections can be combined into a single view called a **broken section**.
The broken section plane is constructed from several standard cutting planes. It is divided into two types:

5.1. Broken Section with Parallel Planes

This section is obtained by cutting the part with a number of parallel and offset planes.
It allows highlighting internal details of the part on a single view.
The change of plane is indicated by a thin chain line, and plane references are drawn with a thick line.
It has the advantage of providing, in a single view, a large amount of precise and clear information without the need for multiple sections.

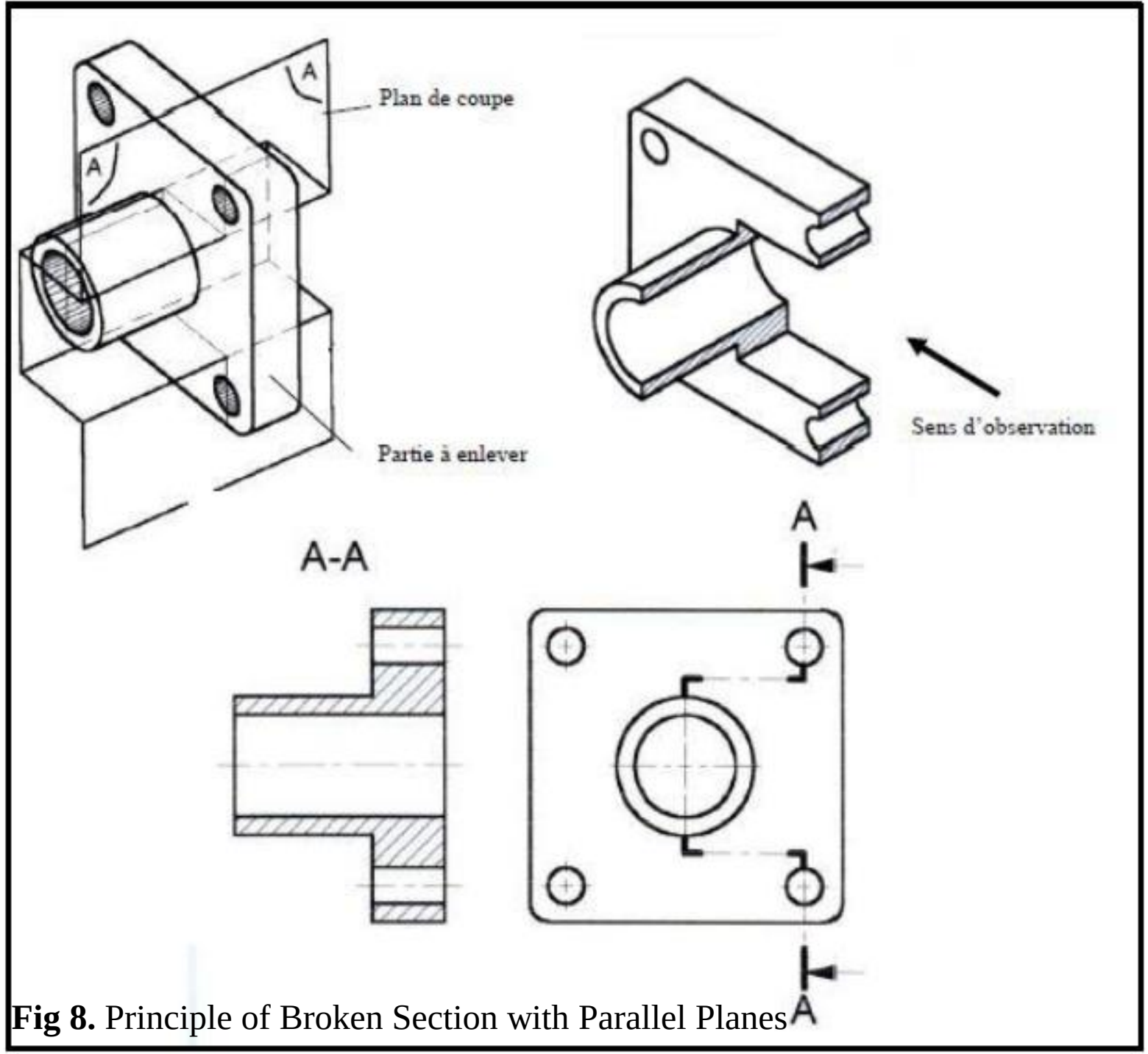


Fig 8. Principle of Broken Section with Parallel Planes

5.2. Broken Section with Intersecting Planes

It allows the definition of internal shapes located in parallel planes that are offset relative to each other.

The cutting plane consists of two intersecting planes. The section view is obtained by bringing the segments cut by the successive cutting planes into a single plane; the cut parts are combined. In this case, the correspondence between views is only partially preserved.

The representation rules remain the same. Discontinuities of the cutting plane (edges or angles) are not drawn in the section view.

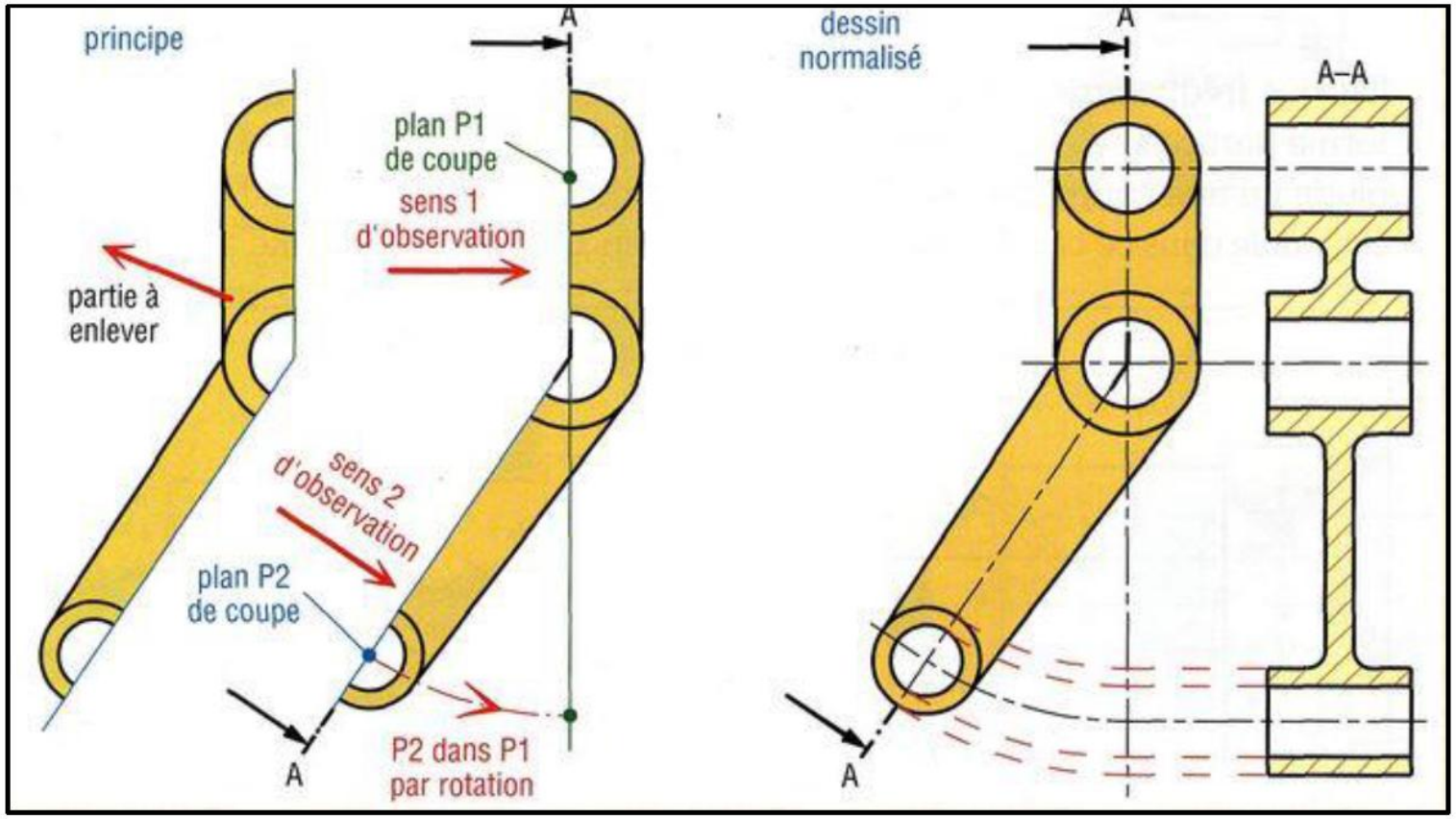


Fig 9. Principle of Broken Section with Intersecting Planes

6. Section of Ribs

In engineering, a rib is a projecting part that can serve to reinforce a mechanical part. Ribs are never cut when the cutting plane passes through the plane of their largest surface. The same rule applies to solid rotational parts (cylindrical or spherical, such as shafts, axles, balls), screws, bolts, nuts, rivets, and keys, as seeing the interior of a solid part is of no interest.

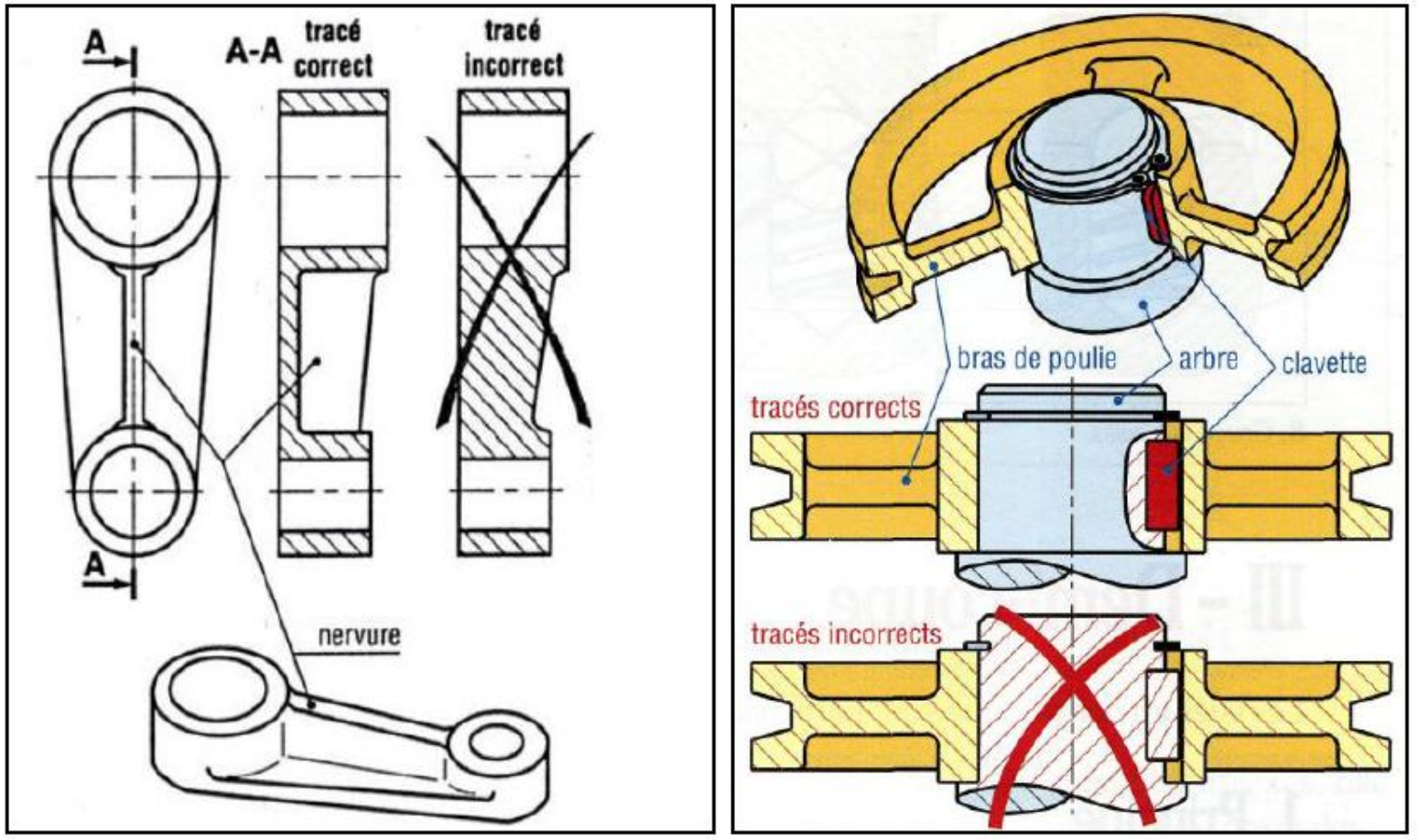


Fig 10. Example of a Section of a Rib, Pulley Spoke, Shaft, and Key

Sections

1. Principle

Sections can be considered as complementary or auxiliary views. They appear as a simplified variant of section views and allow for the precise definition of a shape, contour, or profile by eliminating many unnecessary lines.

Sections are defined in the same way as cuts: cutting plane, arrows, etc.

In a section, only the cut part is drawn, where the material is actually cut or sawed. In a regular section, in addition to the cut part, all visible parts beyond (behind) the cutting plane are also drawn.

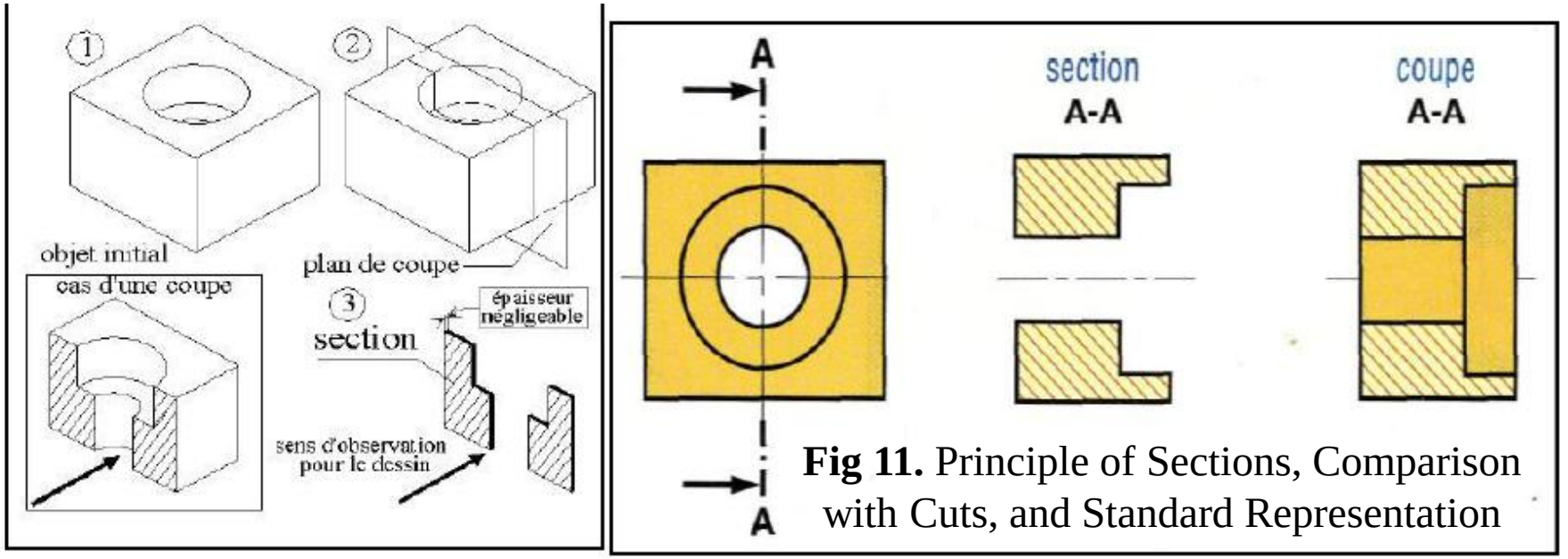


Fig 11. Principle of Sections, Comparison with Cuts, and Standard Representation

2. Removed Sections

These are special sections. They are usually drawn aligned with the cutting plane if space allows.

Or in another position with identification elements (the intersecting plane, viewing direction, letters, and hatching).

Indicating the cutting plane can be omitted.

Contours are drawn with thick continuous lines.

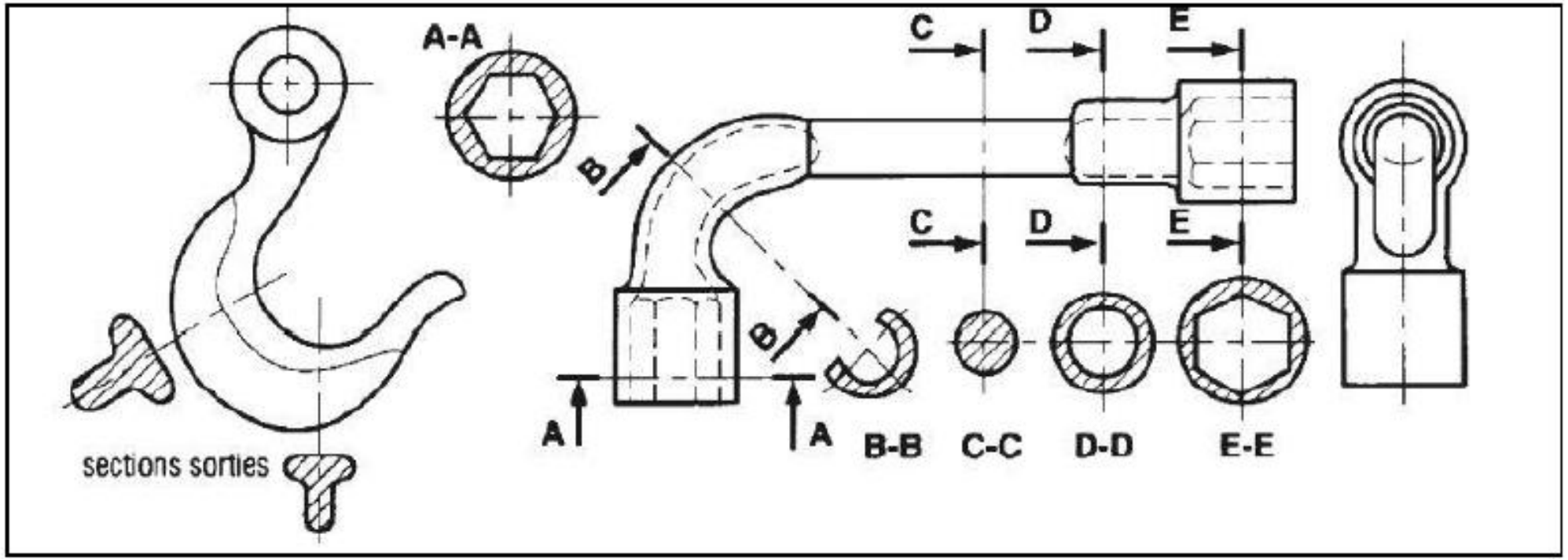


Fig 12. Examples of Removed Sections and Principle of Representation

3. Folded Sections

These sections are drawn with thin continuous lines (no thick lines) directly on the standard view (superimposed).

For clarity, it is sometimes preferable to erase or remove the shapes of the object seen under the section; if these shapes are necessary, a removed section is preferred. Indicating the cutting plane is generally unnecessary.

If there is a risk of ambiguity, the viewing direction must be indicated.

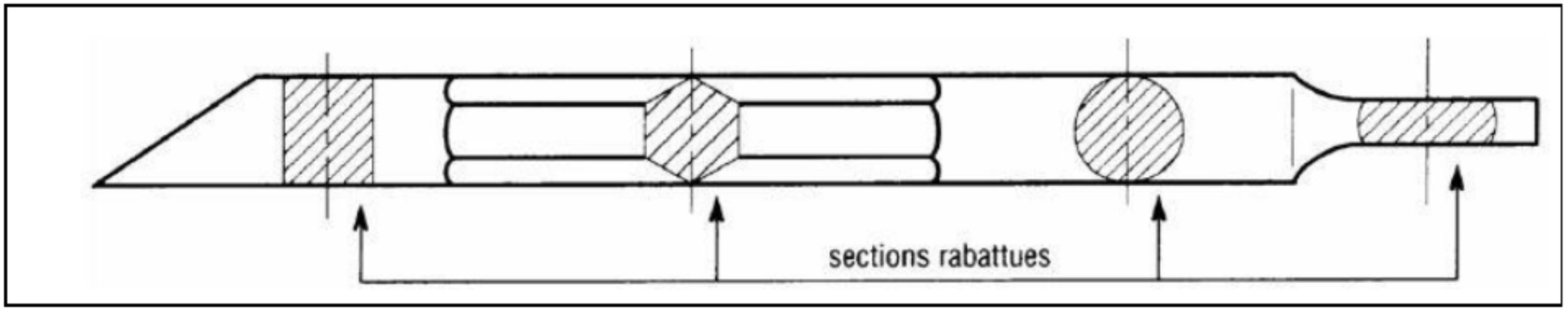
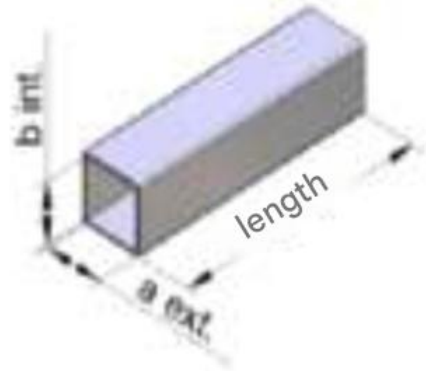
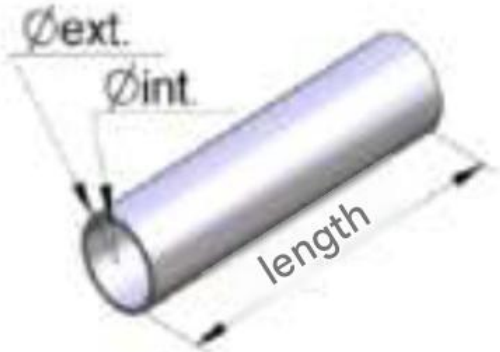
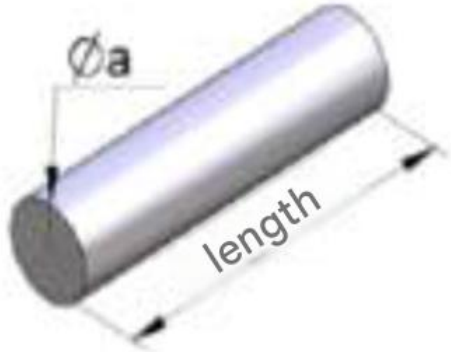
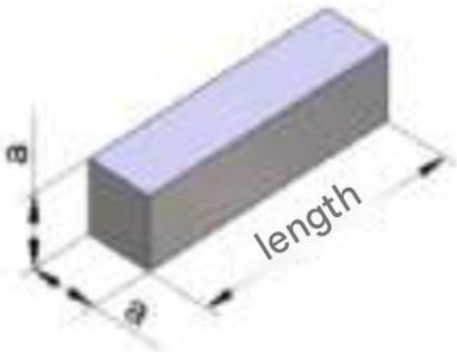
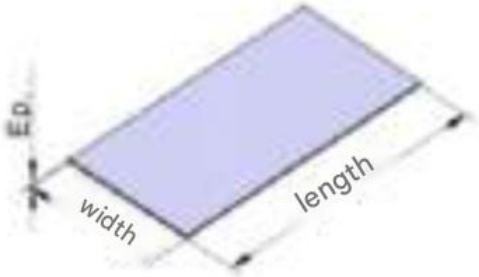
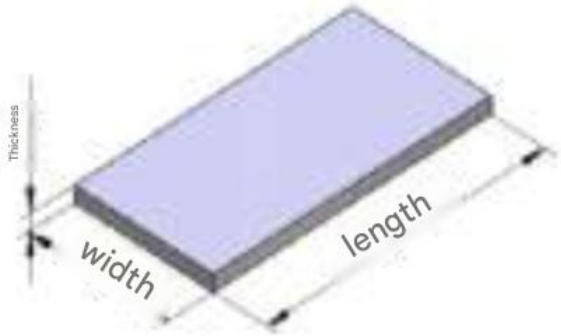
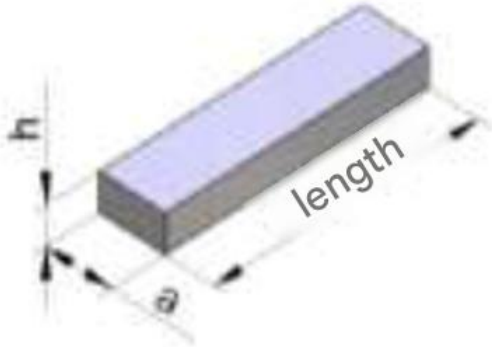
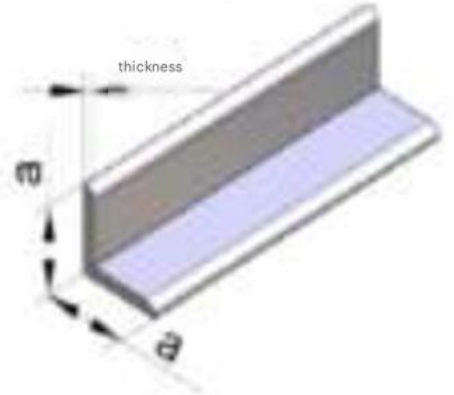


Fig 13. Examples of Folded Sections

Technical Vocabulary of Common Part Shapes

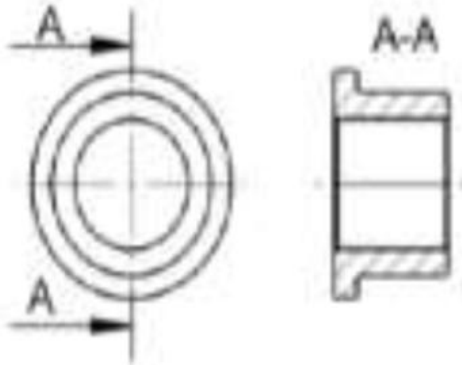
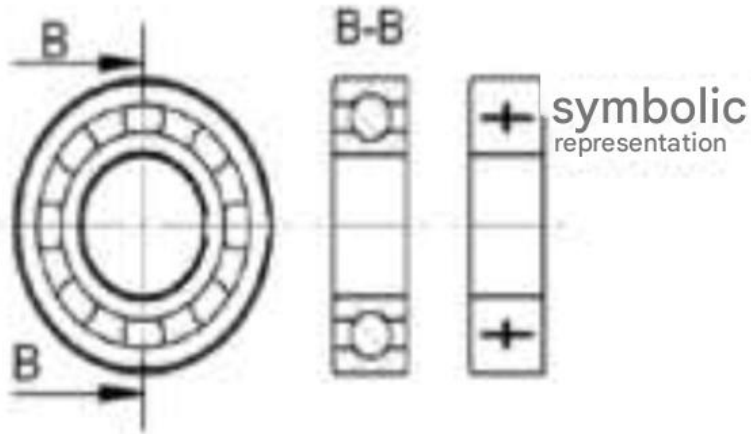
PROFILES:

Square tube	Round tube	Round bar	Square bar
			
Sheet	**Plate**	**Flat**	**Angle**
			

ASSEMBLY COMPONENTS:

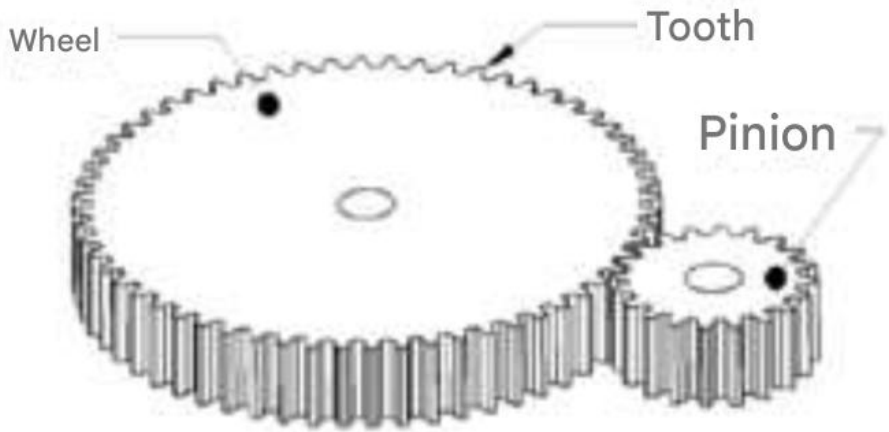
Hex head screw (H screw)	Socket head cap screw (SHCS screw)	Washer	Nut
			
Stud	External retaining ring (shaft circlip)	Internal retaining ring (bore circlip)	Retaining pin (Mécanindus pin)
			

ROTATIONAL GUIDING ELEMENTS:

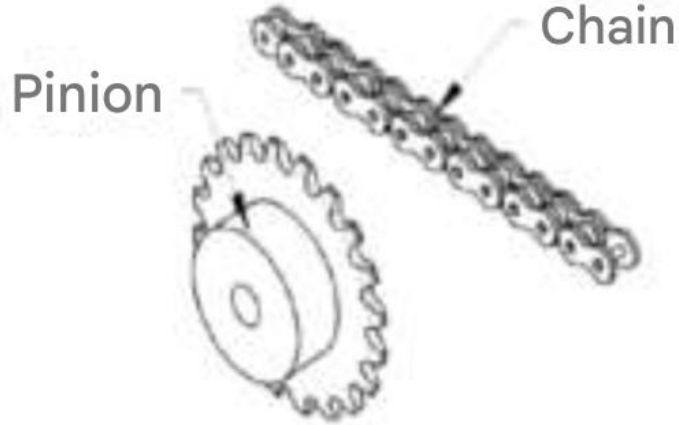
Designation	3D Visualization	2D Representation
Self-lubricating ring (bearing)		
Single-row deep groove ball bearing		

MOTION TRANSMISSION ELEMENTS:

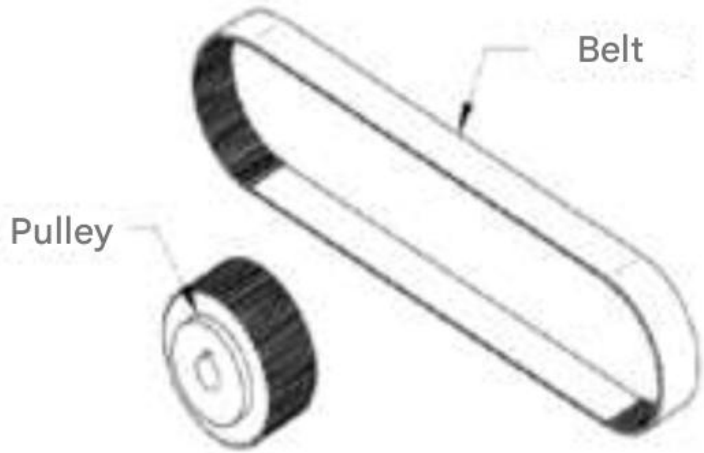
Gear train transmission



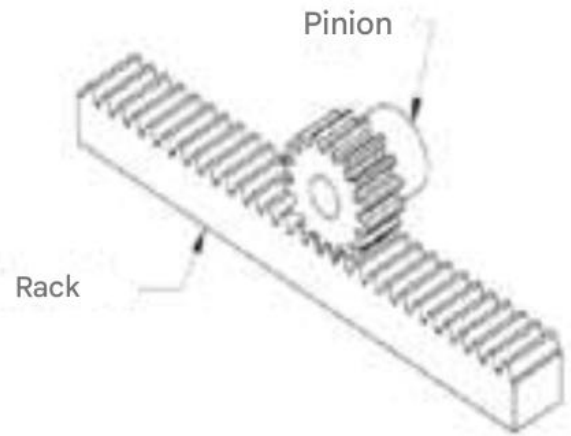
Gear and chain transmission



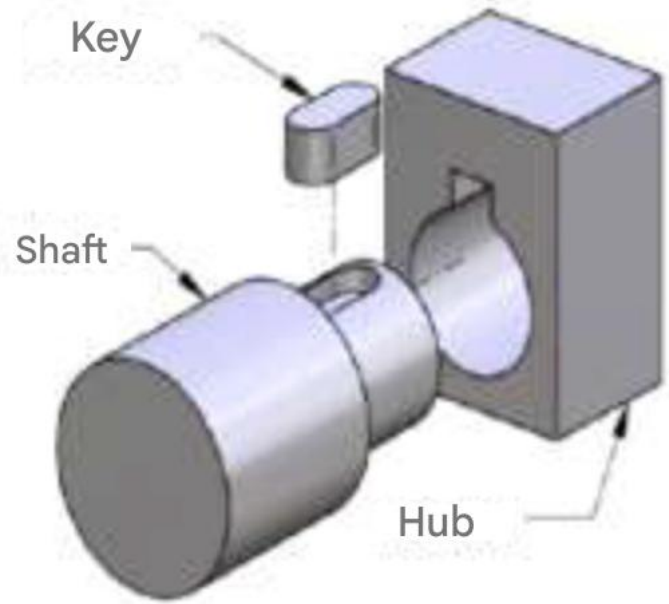
Pulley and belt transmission



Rack and pinion transmission



OTHER COMPONENTS:

O-ring (provides sealing function)	Spring (provides force return function)	Key (ensures a fully removable connection)
 Material: Rubber	 Material: Steel	

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