



People's Democratic Republic of Algeria
Ministry of Higher Education and Scientific Research
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Institute of Science and Technology
Department of Civil and Hydraulic
Engineering

Technical Drawing

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

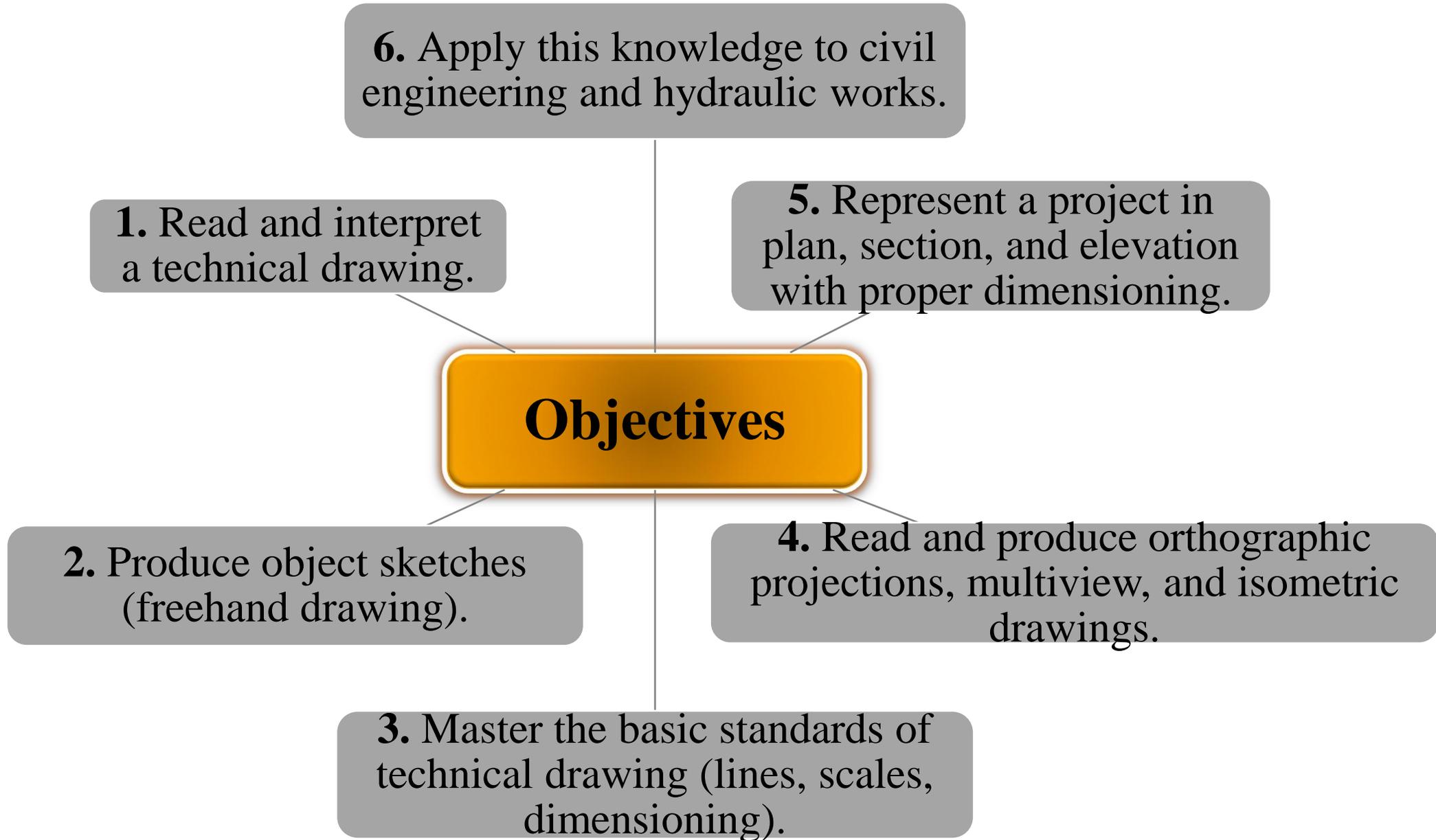
Presented by:
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- Technical drawing = the universal language of engineers
 - A tool for communication and design
 - Essential in civil and hydraulic engineering
- Combines manual drawing and CAD (e.g., AutoCAD)

💡 *“A good engineer must know how to read and write the language of technical drawing.”*

🎯 At the end of the course, the student will be able to:



Chapter I:
GENERALITIES ON
TECHNICAL DRAWING

Definition of Technical Drawing:

Technical drawing, whether manual or computer-aided (CAD), is the universal language of all technicians and engineers in industrial fields for representing technical objects according to established standards.

Technical Drawing Instruments:

- **Pencil:** type H or HB, or even a mechanical pencil for fine lines, and type B for thick lines, as well as an eraser.
- **Measuring tools:** protractor, set squares (30°-60° or 45°), compass, ruler, T-square, etc.
- **Paper pad** and a **cloth** for cleaning.
- **CAD software** (Computer-Aided Drawing/Design).

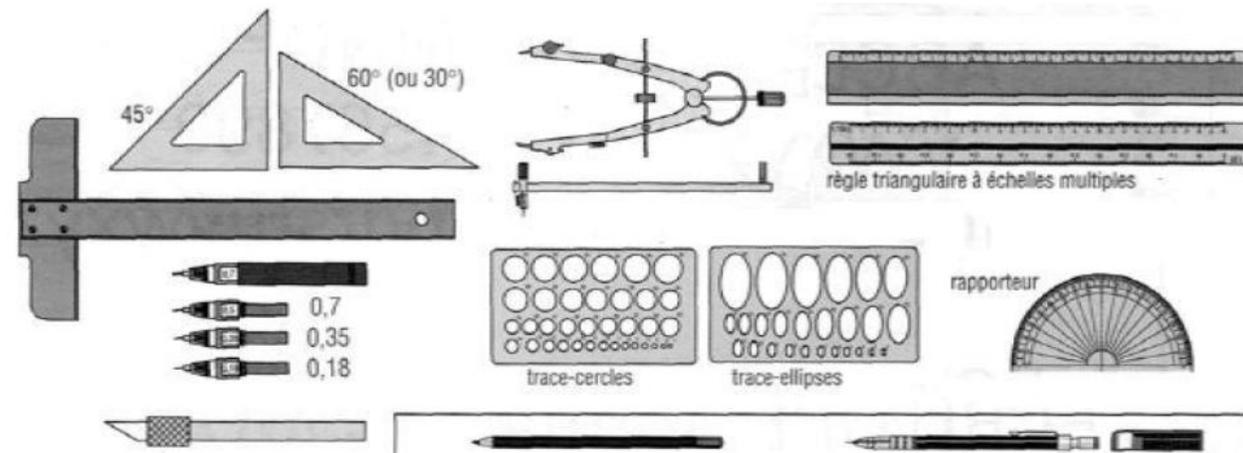
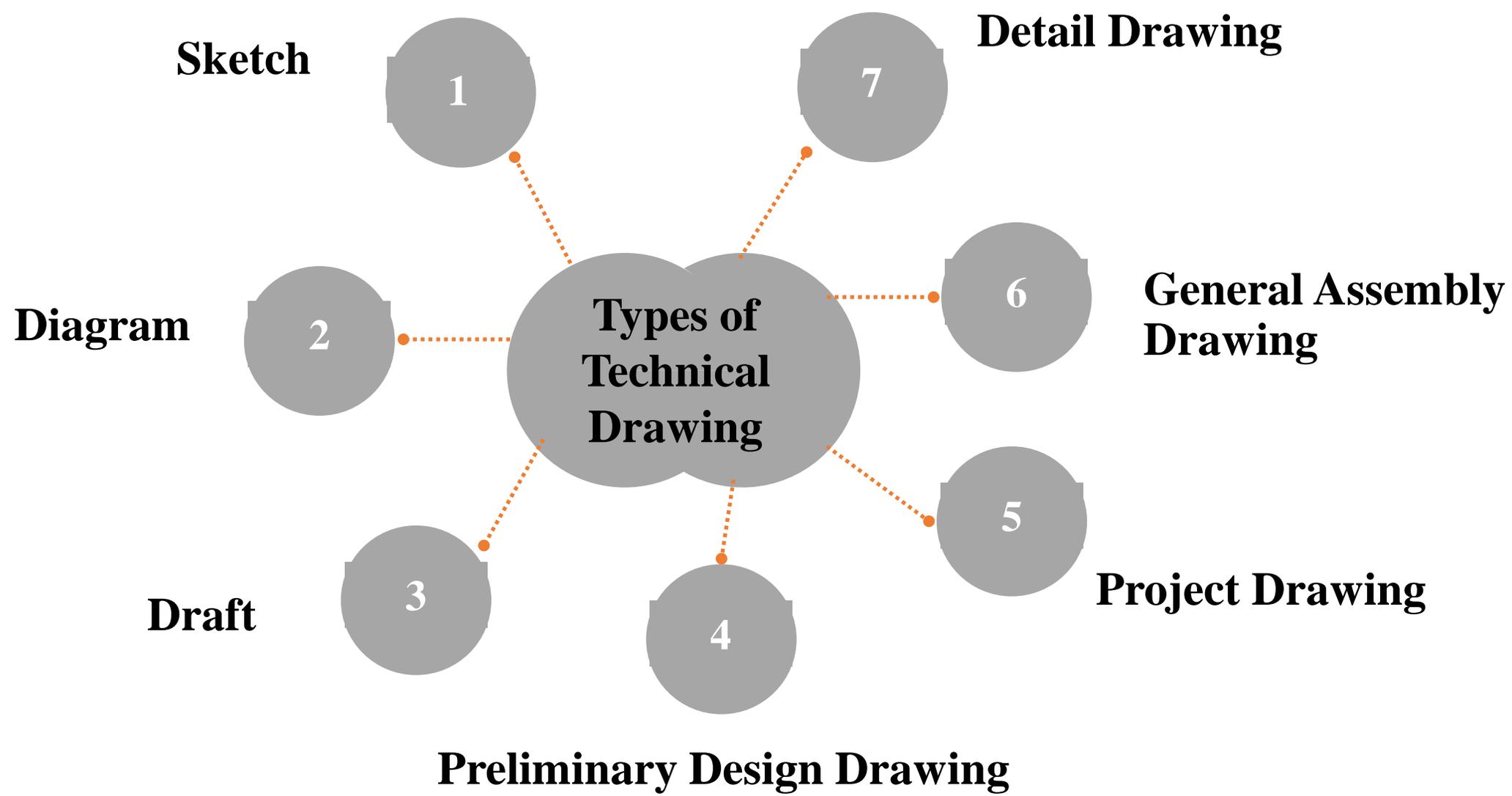


Fig. 1: Technical Drawing Instruments

Different Types of Technical Drawing



1) Sketch

It is a graphic representation, usually made freehand, that respects the shape and position of the technical object.

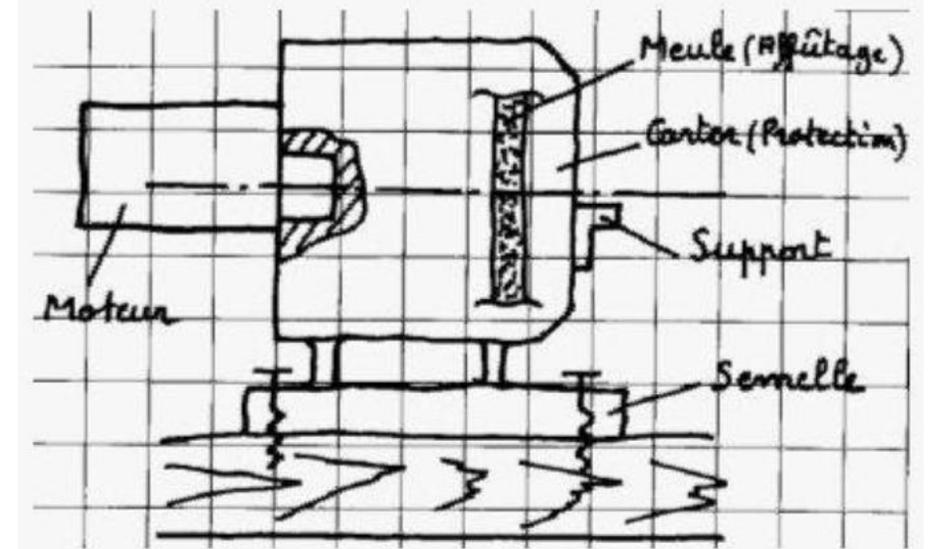


Fig. 2: Example of a sketch

2) Diagram

It is a graphic representation of a technical object, in a more or less symbolic form. It is used to present the design and explain its functioning.

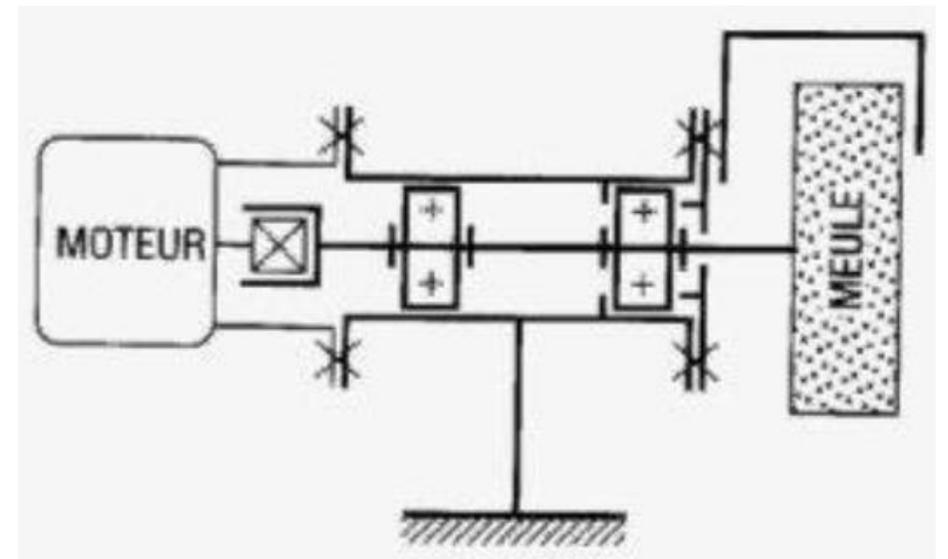


Fig. 3: Example of a diagram

3) Draft

It is the initial drawing of a project, made with light pencil lines to allow for possible corrections.

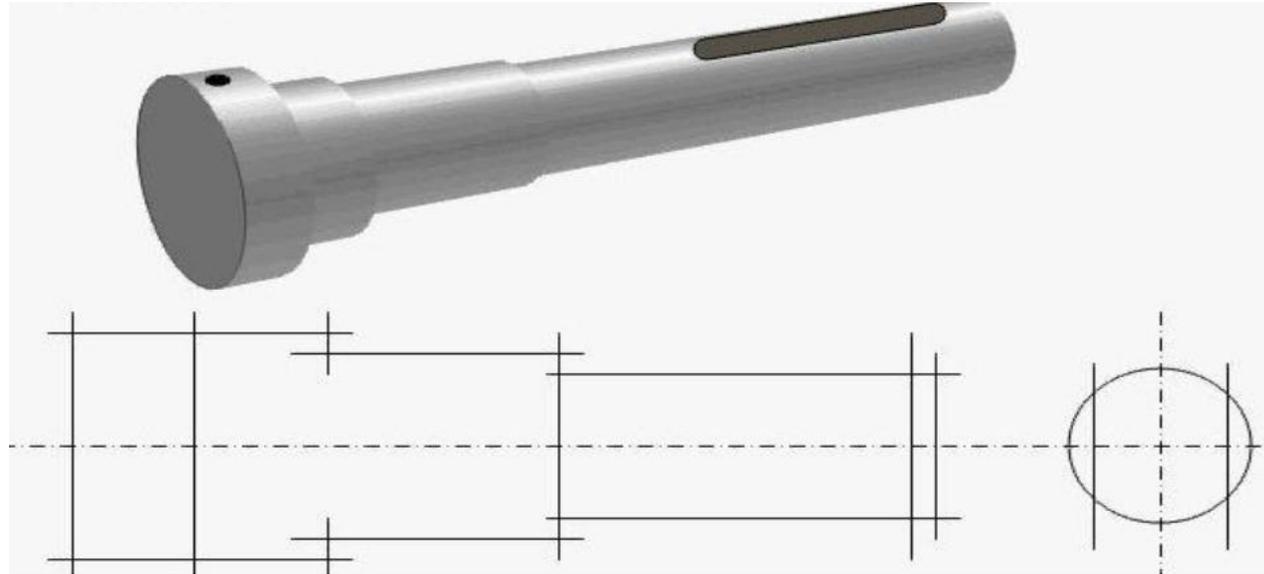


Fig. 4: Example of a draft

4) Preliminary Design Drawing

This drawing is produced from a given idea and represents a viable solution that meets the set objective. It shows the different important phases of the project, such as the functioning and the shapes of the main constituent parts.

5) Project Drawing

It is a drawing that provides the necessary details to define a chosen solution. It is based on the preliminary design drawing.

6) Assembly Drawing

It provides, in more or less detail, the representation of all or part of a system, an object, or an installation..

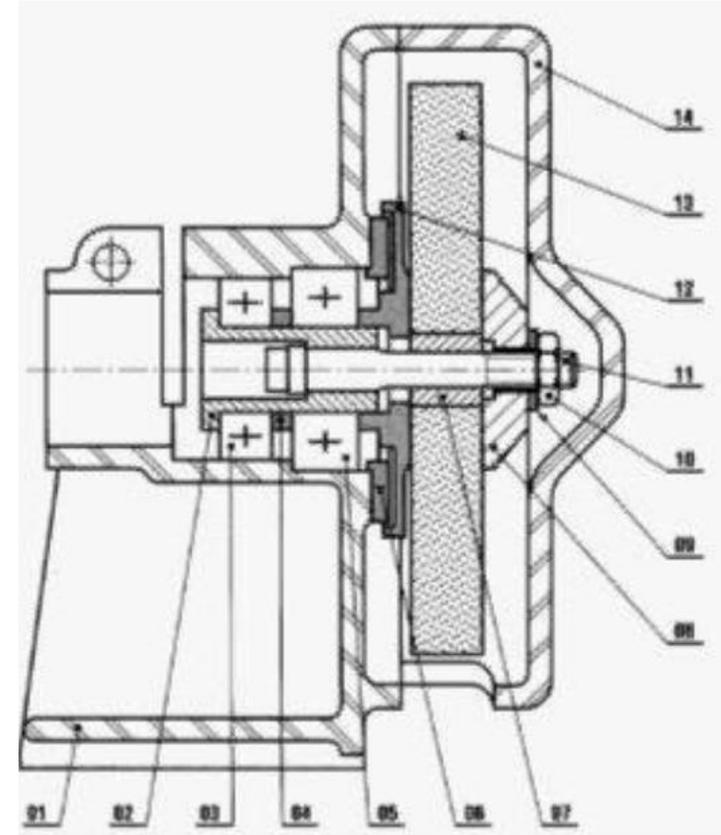


Fig. 5: Example of an assembly drawing

7) Detail Drawing

It represents a single part with full dimensions to allow its manufacturing. From the detail drawing, additional information may be added as needed for the realization of the product, depending on whether it concerns manufacturing, assembly, installation, or implementation.

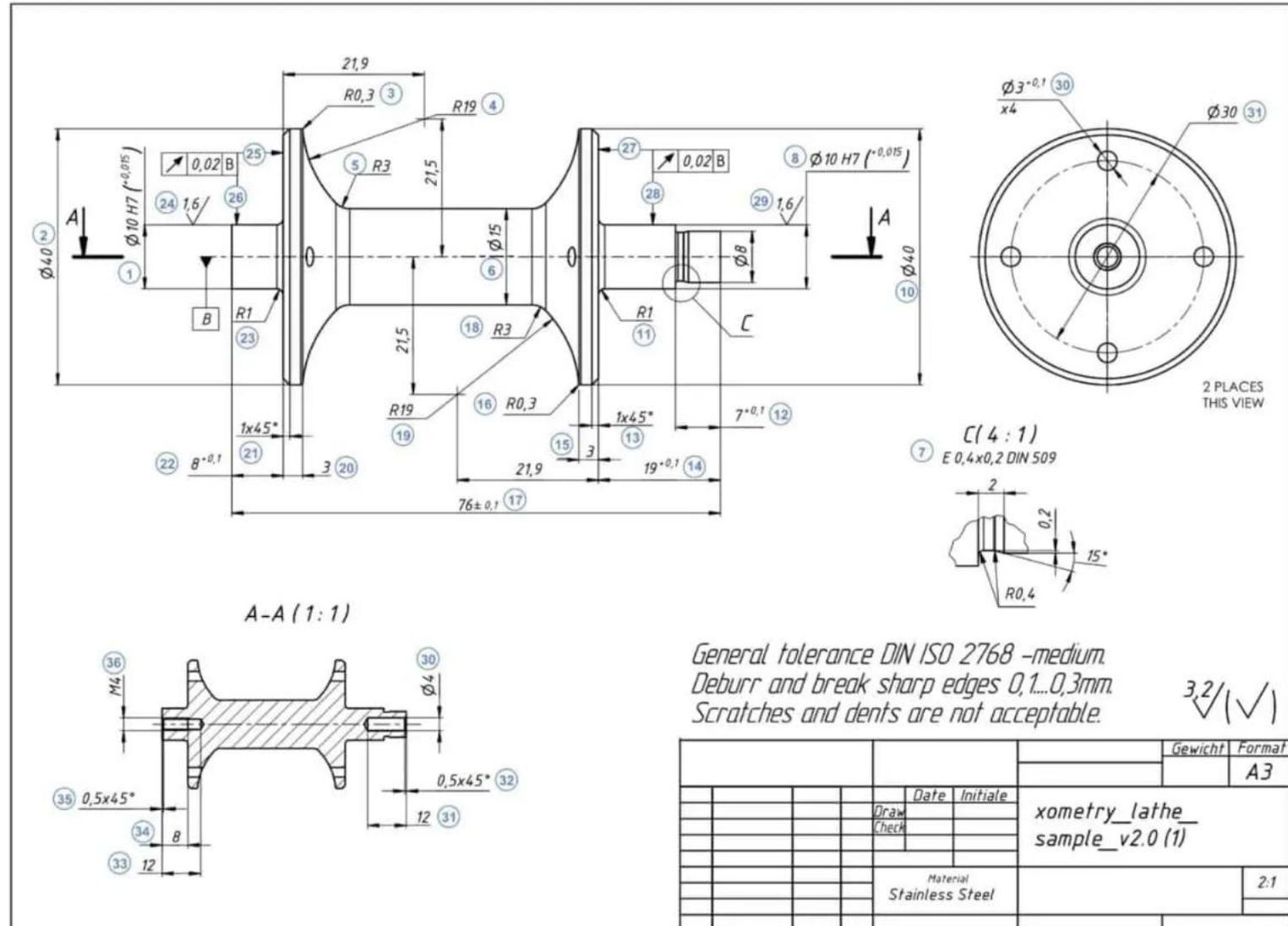


Fig. 6: Example of a detail drawing

There are two other types of drawings in 3D:

Perspective drawing: Represents the object in volume. It shows it as the eye would see it. The dimensions of the object are not respected, and not all dimensions are visible.

Exploded view drawing: Represents, in perspective, the parts of an object in relation to one another. It allows for a better understanding of the functioning and assembly of the object.

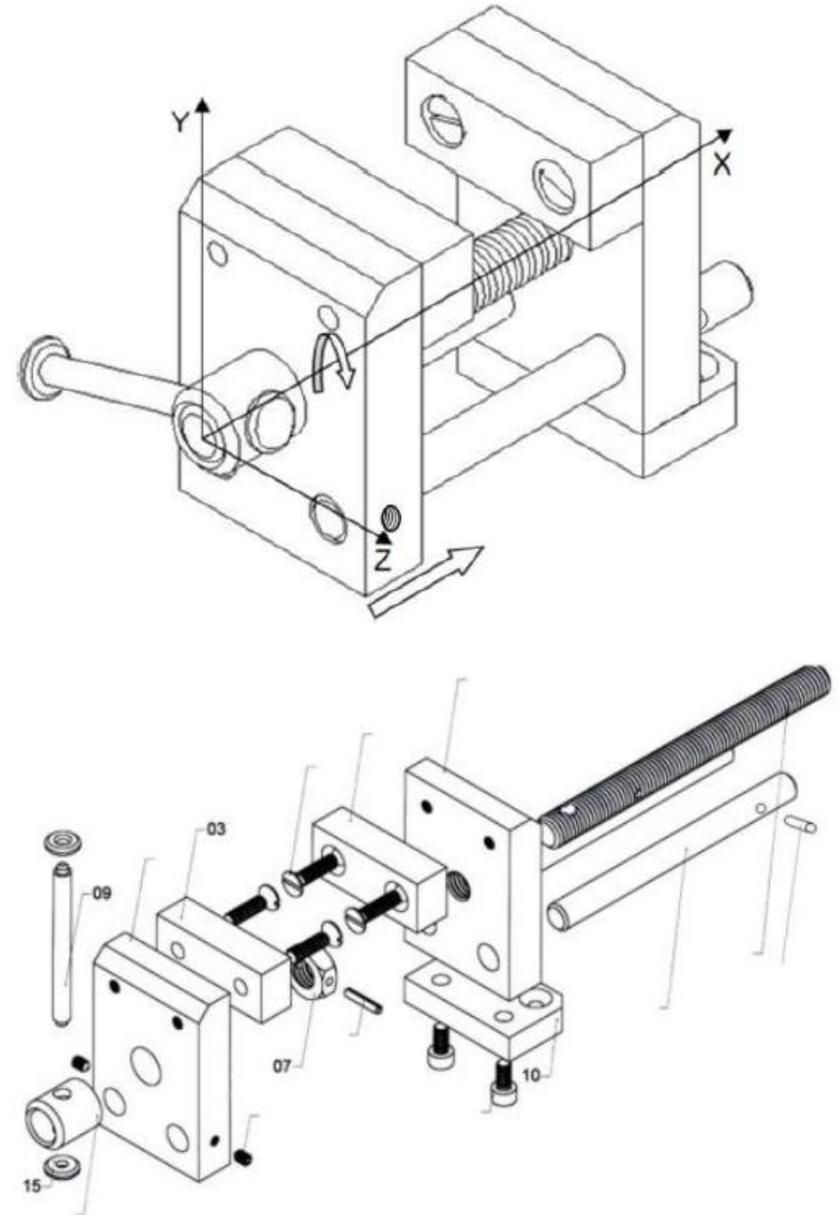


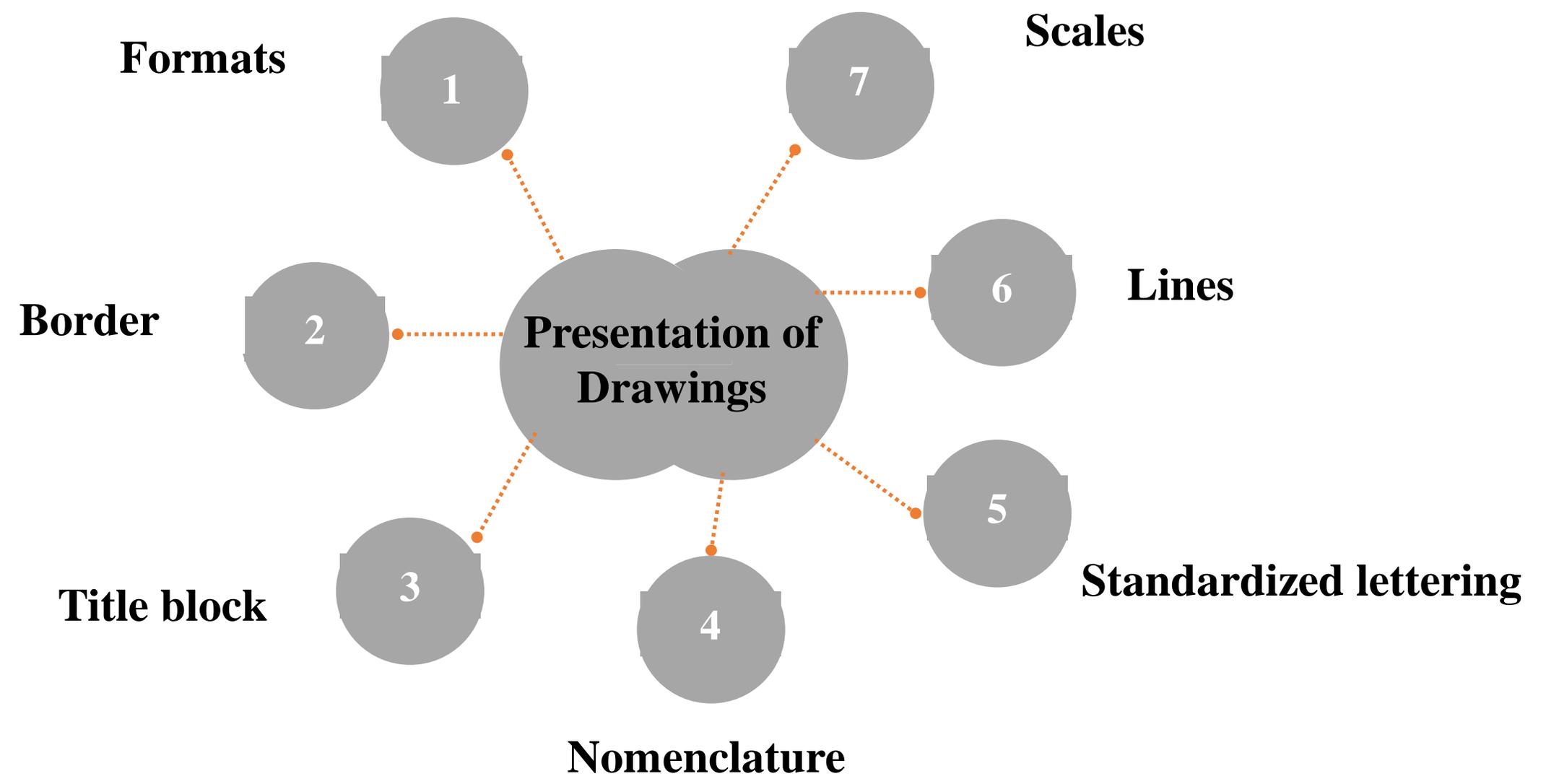
Fig. 7: Example of a Perspective and Exploded view drawing

Standardization

It is the set of standards/rules to be followed when producing a technical drawing, published by a standardization body.

Note: ISO (International Organization for Standardization) is responsible for codifying certain graphic tools: lines, formats, lettering. It is used in most countries except the U.S. and Canada.

Presentation of Drawings



1) Formats

Formats refer to the size of the tracing sheet or paper on which the drawing is executed. The basic format is **A0** (read: A zero), with an area of **1 m²** and dimensions of **1189 × 841 mm**.

All other formats are obtained from A0 by successive subdivisions, each time dividing the longer side by two.

A1: 841 × 594 mm

A2: 594 × 420 mm

A3: 420 × 297 mm

A4: 297 × 210 mm

The ratio of length to width is equal to $\sqrt{2}$.

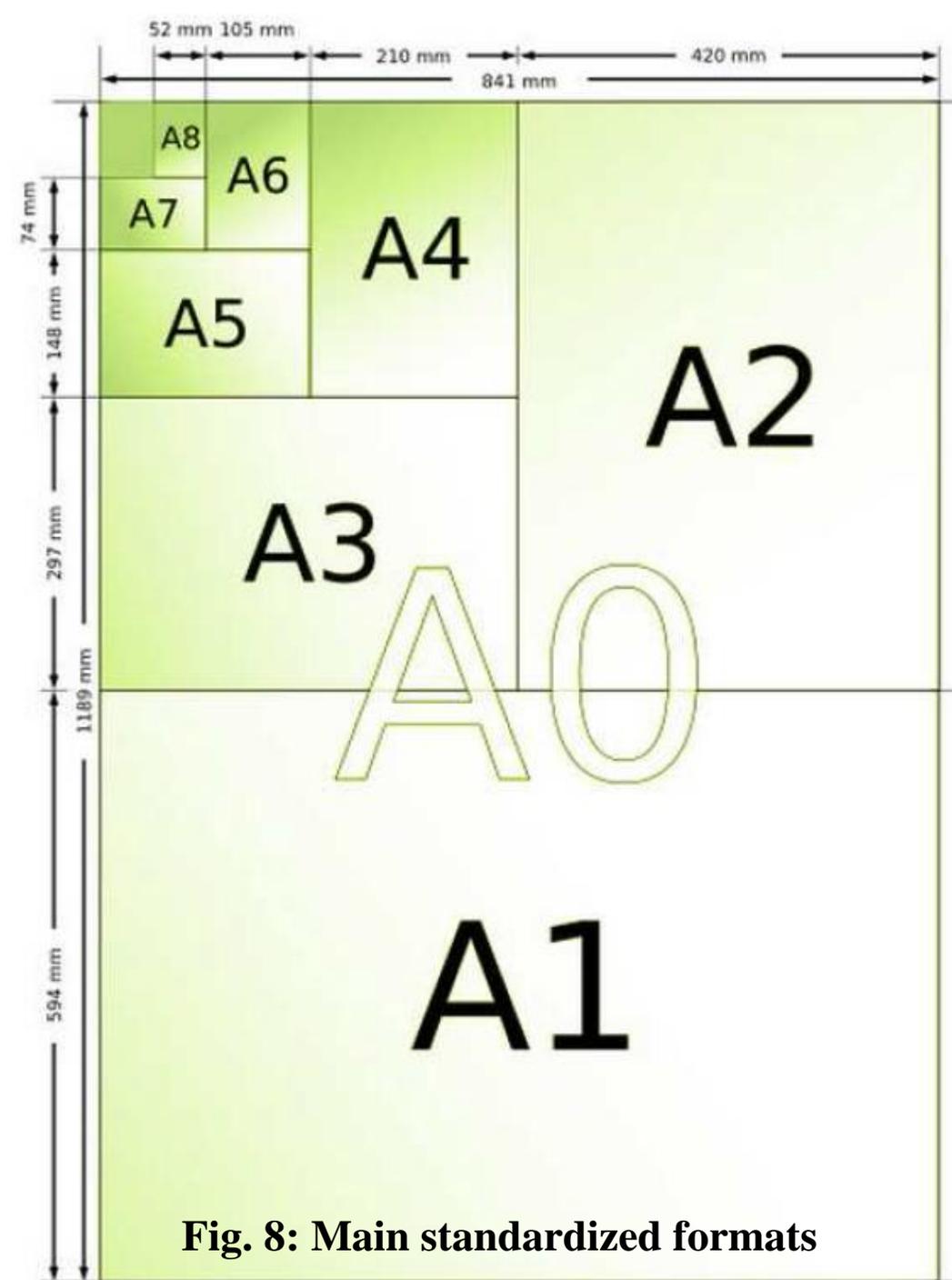


Fig. 8: Main standardized formats

2) The Border

The drawing area is delimited by a border drawn with a thick continuous line. The margin between the border and the edge of the sheet is **10 mm** for A2, A3, and A4 formats, and **20 mm** for A0 and A1 formats.

3) The Title Block

It is the identity card of the technical drawing. It is located at the bottom right of the sheet. For A4 format, it occupies the entire width of the border. The title block contains the following information: the drawing title, the drawing scale, the draftsman's identity (name, surname, class), the date, and the name of the institution.

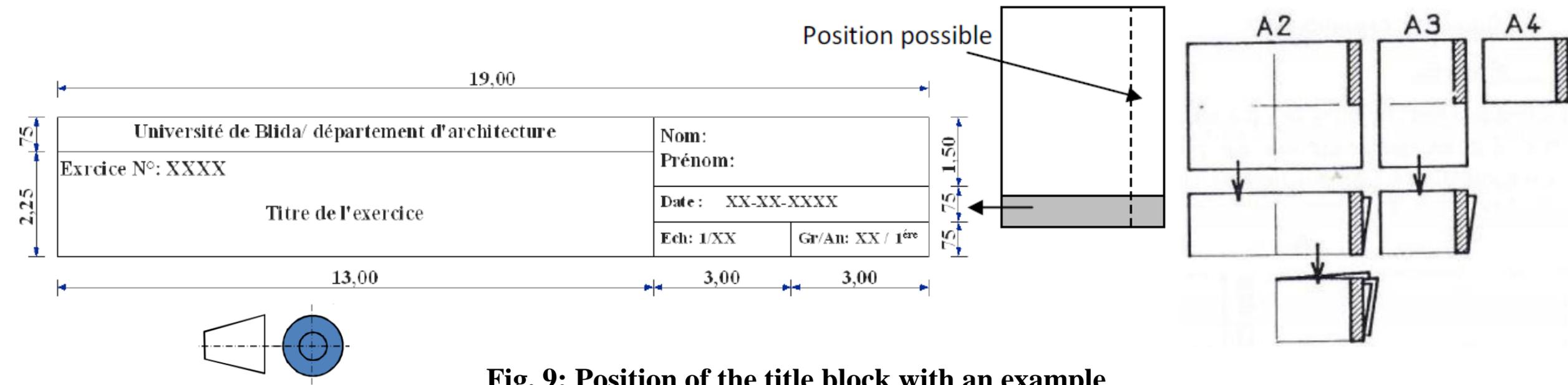


Fig. 9: Position of the title block with an example

4) Nomenclature

It complements the assembly drawing by listing all the components of the drawn system (parts, standard components). Each element is identified, numbered, classified, and all necessary information about it must be included.

The information is as follows:

The reference mark of each part (**REF**)

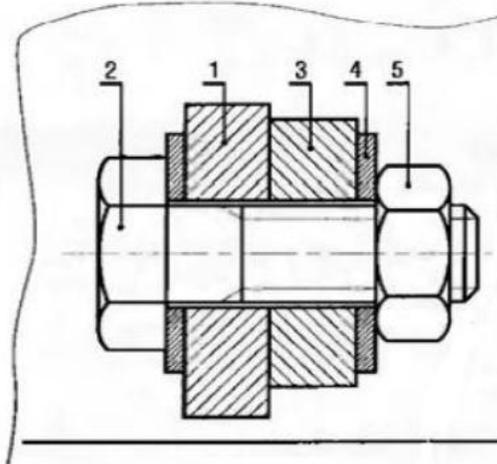
The quantity of each part (**QTY**)

The name of the parts (**DESCRIPTION**)

The material of each part (**MATERIAL**)

A remark or note if necessary

(**REMARKS**)



The figure shows a technical drawing of a bolt assembly with five numbered parts. To the right is a parts list table with columns for reference mark, quantity, description, material, and observations. A 'cartouche' (bracket) spans the description, material, and observation columns. A vertical dimension of 65 is indicated on the right side of the table.

repère	nombre		matière	observations
5	1	Ecrou H, M12-8		
4	2	Rondelle CS 12-24		Cadmié
3	1	Bras	E 28	
2	1	Vis H, M 12-45, 8-8		
1	1	Bâti	E 24	
Rep.	Nb	Désignation	Mat.	Dbs.

Fig. 10: Example of a parts list (nomenclature)

The parts list is always placed above the title block and oriented according to the reading direction of the drawing. It may sometimes be on a separate sheet and is arranged from bottom to top.

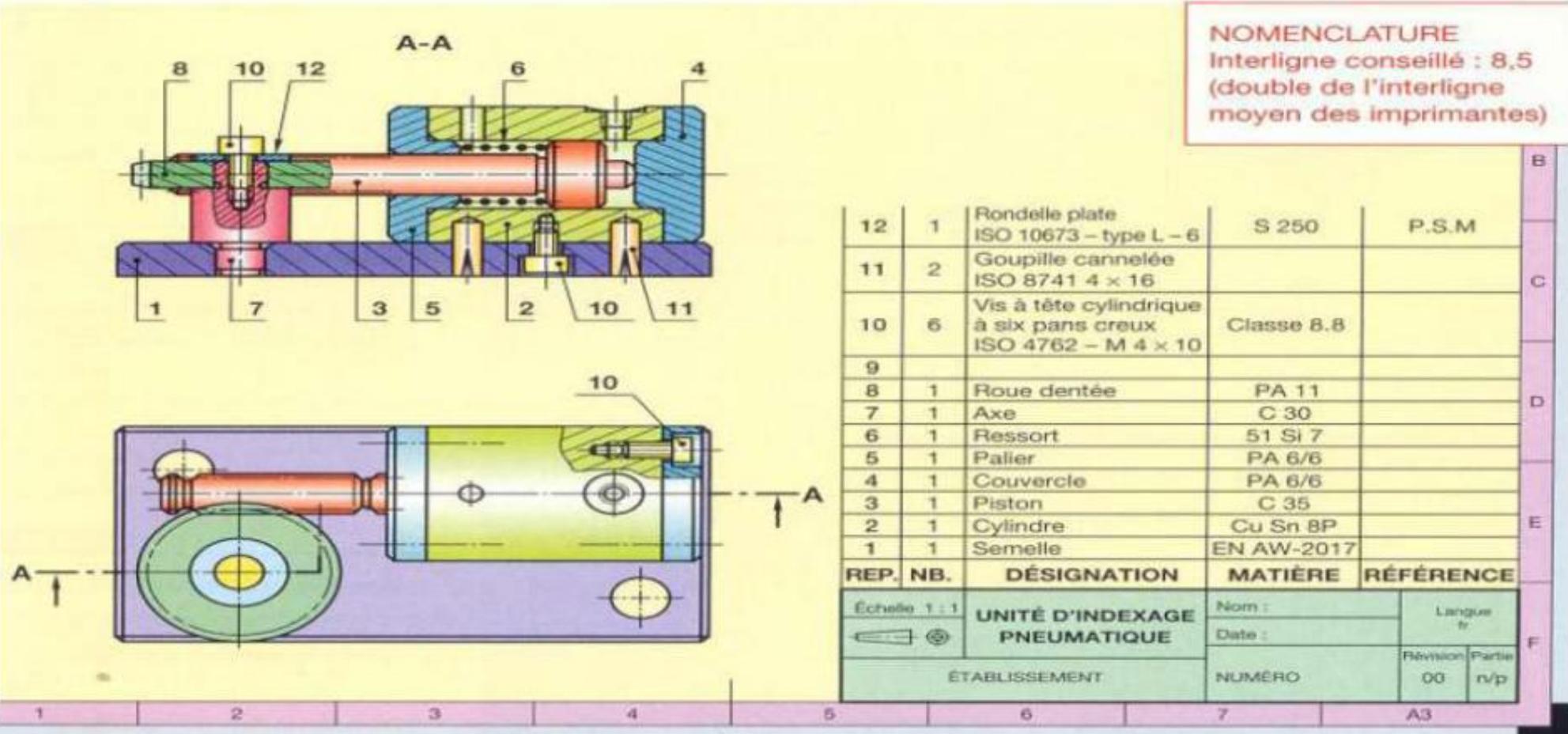


Fig. 11: Example of a parts list (nomenclature)

5) Standardized Lettering

The standardization of lettering aims to ensure the readability, uniformity, and reproducibility of characters and symbols. Lettering may be uppercase or lowercase, upright or inclined, as shown in the following example.

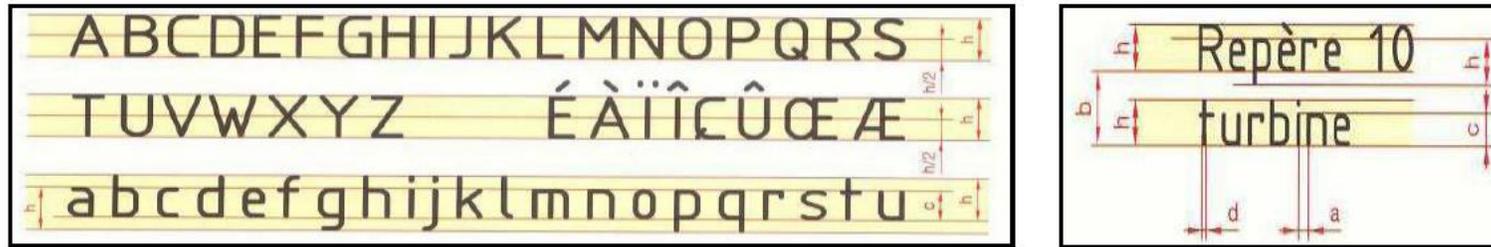


Fig. 12: Standardized lettering

Lettering is characterized by the nominal height h of the capital letters. The other dimensions (a , b , c , d , and e) are defined in relation to this height. The values of h are chosen from the dimensions given in the table below.

Dimension nominale h		2,5	3,5	5	7	10	14	20	
Hauteur des majuscules (ou chiffres)	h	Espace entre les caractères					$a = 0,2 h$		
Hauteur des minuscules sans jambage	$c = 0,7 h$	Largeur des traits d'écriture					$d = 0,1 h$		
Hauteur des minuscules avec jambage	h	Interligne minimal					$b = 0,4 h$		

Tab. 1: Nominal dimension h

- For formats A2, A3, and A4, **h** = **2.5** (it is recommended not to use lowercase letters)
- For formats A0 and A1, **h** = **3.5**

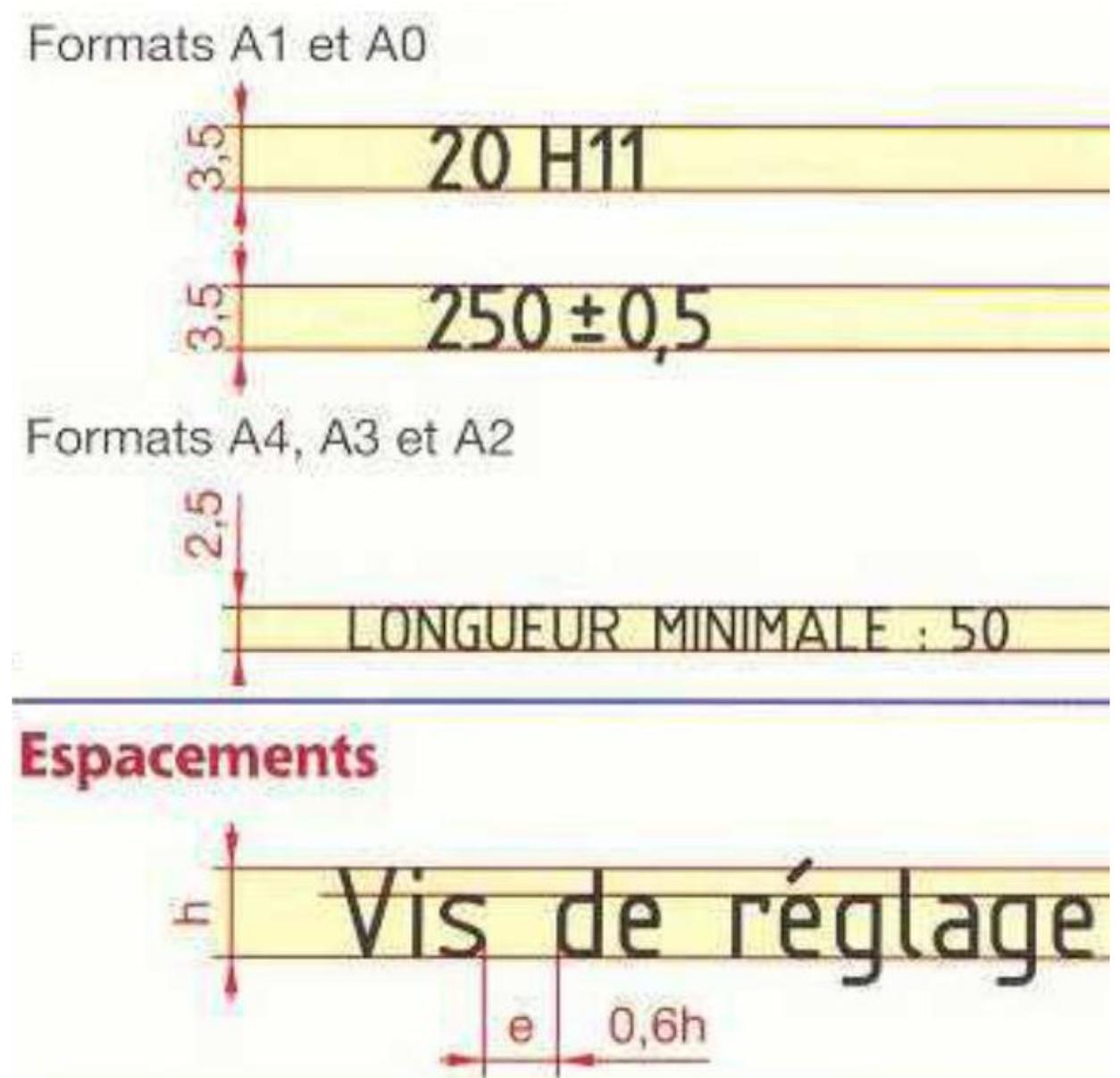
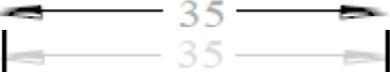


Fig. 13: Minimum dimensions according to the format

6) Lines

In technical drawing, a set of standardized lines is used, each characterized by: Its type (continuous, dashed, chain), Its thickness (thick, thin)

	<p>Continuous lines</p> <ul style="list-style-type: none"> • Thick: Visible sections, Ground level lines, Drawing frames and title blocks, Arrows indicating the direction of observation or access
	<p>Continuous lines</p> <ul style="list-style-type: none"> • Medium: Visible edges and contours, Main contour lines, Thresholds, steps, stairs, Joinery in section in general drawings
	<p>Continuous lines</p> <ul style="list-style-type: none"> • Thin: Geometric constructions, Folded sections, Fictitious contours, Arrows indicating the opening direction of doors or stair ascent, Intermediate contour lines, Dimension and extension lines, Tiling and paving layouts, Furniture, Hatching
	<p>Dashed lines</p> <ul style="list-style-type: none"> • Thick: Hidden contours, Hidden piping, Parts to be demolished
	<p>Dashed lines</p> <ul style="list-style-type: none"> • Medium: Hidden contours, Hidden piping, Parts to be demolished, Electrical lines
	<p>Dashed lines</p> <ul style="list-style-type: none"> • Thin: Hidden fictitious contours, Some hatching
	<p>Chain (mixed) lines</p> <ul style="list-style-type: none"> • Thick: Traces of section and cut planes
	<p>Chain (mixed) lines</p> <ul style="list-style-type: none"> • Medium: Main axes of symmetry planes Axes of structural elements, bays, and layouts ,Party wall axes, Traces of section planes
	<p>Chain (mixed) lines</p> <ul style="list-style-type: none"> • Thin: Secondary axes of all types, Break lines
	<ul style="list-style-type: none"> • Dimension lines • Leader lines

Tab. 2: Standardized lines

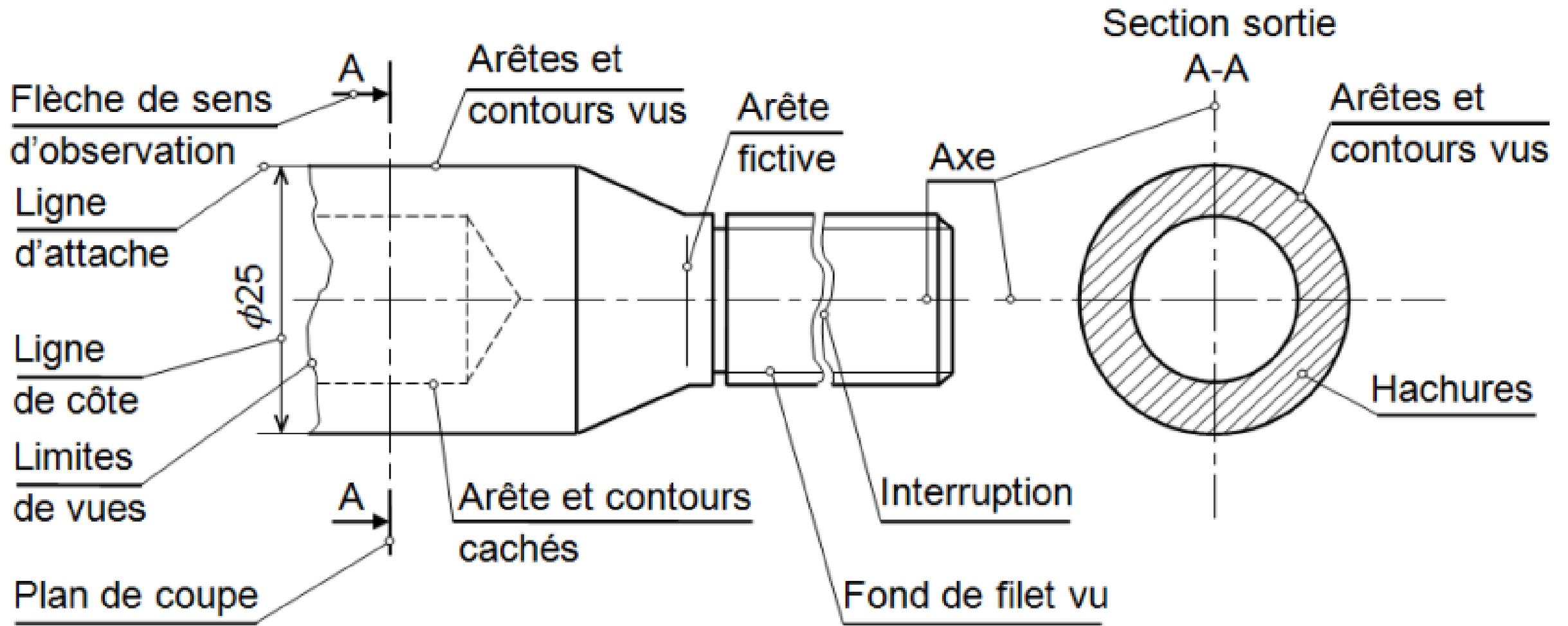


Fig. 14: Example of line usage

7) Scales

The use of a scale makes it possible to represent objects of large or very large dimensions on a usable sheet format (e.g., building plan), or conversely, to represent very small systems at a more easily visible size.

The scale of a drawing indicates the ratio between the drawn dimensions and the actual dimensions of a part or a mechanism

The formula to determine the scale is:

$$\text{Scale} = \frac{\text{Drawing dimension}}{\text{Actual dimension}}$$

- **Full scale (1:1):** the drawing is the same size as the real object.
- **Enlargement scale (x:1):** e.g., 2:1 means the drawing is twice as large as the real object.
- **Reduction scale (1:x):** e.g., 1:2 means the drawing is half the size of the real object.

Example 1:

Draw an object to scale by applying a proportionality rule. For instance, the line segment AB below, measuring 5 cm, is reduced 5 times. For this purpose, we use a reduction factor with a value of $1/5$.

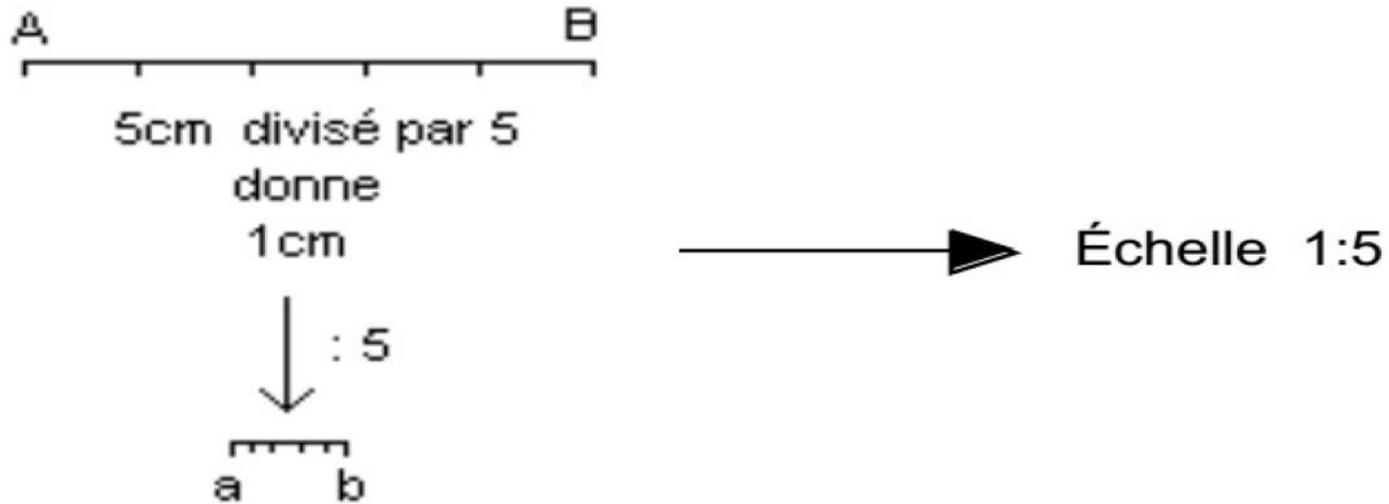


Fig 15: Example of a scale

Example 2:

Determine the drawing scale :

Actual length = 684 mm

Drawing length = 171 mm

Scale = $171 / 684 = 0.25 = 1/4 \rightarrow$ Scale = 1:4

Conclusion

Technical drawing is an essential tool in the machining industry, as it allows the design of a part to be conveyed to the machinist in a precise and accurate manner. **Technical drawings** ensure the functionality of parts, reduce material waste, and meet quality standards. They are used to represent components to scale with the necessary dimensions and explanations to illustrate the complex operation and construction of spare parts and assemblies.

Technical drawings are standardized in each country, which facilitates their reading and implementation by every department.

In summary, **technical drawing** is an indispensable and universal means of expression for technicians, enabling precise and rigorous communication between the fields of planning and manufacturing.

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