CHAPTER

4

STANDARDISATION

LEARNING OBJECTIVES

1. To know about the definition of standardization, interchangeability and fits.
2. To know about ISO, BIS and its functions.

TABLE OF CONTENT

4.1 INTRODUCTION

- When we manufacture a machine, we need thousands of components. To accomplish this, various materials are used. The required parts are machined in various machines. In the olden days, the conventional machine is used like lathe, drilling machine, shaping machine, milling machine, grinding machine etc. But now a days, CNC and NC machines are used to reduce the production time and cost with very high accuracy as they needed. Man power has reduced and machine power has increased to achieve the required quality of the components.
- The components accuracy depends on the machine accessories, tool materials and angles. But it is not always possible to keep exact measurement in mass production. If sufficient time is given, any operator would work and maintain the sizes with in a close degree of accuracy. Hence, tolerance was introduced, it helps to increase the production and to achieve the required fits. The same standards follow all over the world which helps their sales internationally.

4.2. STANDARDISATION

Standardization is the process of creating protocols to guide the creation of a goods or service based on the consensus of all the relevant parties in the industry.

Standardization means to determine standards related to size, quality, allowance, process, design, weight, color etc., of the product. It helps in ensuring uniformity in the quality of the product.

4.3. INTERCHANGEABILITY

If a part of the machine breaks or wears, it should be replaced by new one. The new one should be fit correctly with the machine even it produced by any industry or country or state.

For this purpose, the parts are produced with actual size. The actual size may increased or decreased with some extent. The allowed maximum and minimum sizes are given to the machine parts. Then only produced parts are fitted with mating parts accurately. The process of manufacturing parts with dimensional variation within certain limits for fitting purpose to mating parts accurately is called interchangeability.

4.3.1. Advantages of Interchangeability

- The assembly of mating parts is easier.
- The rate of waste in mass production becomes less.
- It reduces assembly time and cheaper by employing unskilled worker.
- Random assembly of components is possible. It reduces cost of production.

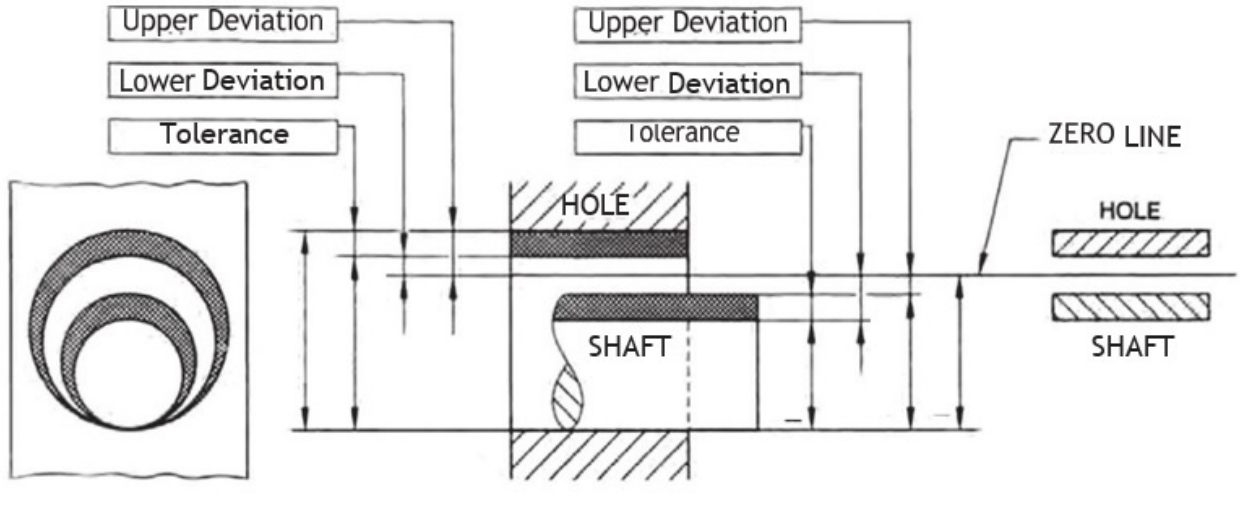


Figure 1 Basic Terminology in Interchangeable System

4.3.2. Basic Terminology in Interchangeable System

Terminology	Description
Shaft	The shaft indicates the outer diameter of a cylindrical profile, but also represents any external dimension of a component.
Hole	The hole indicates the inner diameter of a cylindrical hole but also represent any internal dimensions of a component.
Basic Size	Basic size of a dimension is the size in relation to which all limitsof variations are determined. This is fixed up by designer considering its functional aspects without indicating any tolerance.
Actual size	It is defined as the size of actually obtained by machining. It isfound by measurement using measuring instruments.
Limits of Size	Limits are the two extreme permissible sizes of any dimension, the actual size should lies between these two limits of sizes.
Deviation	The algebraic difference between the actual size and its corresponding basic size is called deviation.
Upper Deviation	It is defined as the algebraic difference between the maximum limitof size and the corresponding basic size.
Lower Deviation	It is defined as the algebraic difference between the minimum limit of size and the corresponding basic size.
Zero Line	The deviations are always measured from basic size. Therefore, to represent limits and fits graphically, a straight line is drawn for basic size. This line is called zero line because the deviation at the basic size is zero. When zero line is drawn horizontally deviations above this line will be positive and below it will be negative. The sign + is added with positive and the sign is added with negative deviations.

4.3.3. Tolerance

Tolerance is the difference between the maximum limit of size and minimum limit of size.

There are two basic ways of specifying the tolerance

1. Unilateral Tolerance
2. Bilateral Tolerance

Unilateral Tolerance: In this system, the tolerance is allowed to only one side of the basic size. Parts manufactured will fall close to the desired dimension but can vary in only one direction.

Example

Component Size	Basic size	Maximum limit	Minimum limit
$20^{+0.02}_{-0.00}$	20.00 mm	20.02 mm	20.00 mm
$20^{+0.00}_{-0.02}$	20.00 mm	20.00 mm	19.98 mm

Bilateral Tolerance: In this system, the tolerance is allowed to both sides of the basic size. One limit will be above basic size and other limit below the basic size.

Example

Component Size	Basic size	Maximum limit	Minimum limit
$35^{+0.02}_{-0.02}$	35.00 mm	35.02 mm	34.98 mm

4.4. FIT

The relation between two parts where one is inserted into the other with certain degree of tightness or looseness is known as fit.

4.4.1. Types of fit

Depending upon actual limits of the hole and the shaft, fit can be dividedinto three types.

1. Clearance Fit
2. Interference Fit
3. Transition Fit

Clearance Fit: If the size of hole is larger than the size of the shaft, then it is called as clearance fit. This results in two conditions. They are maximum clearance and minimum clearance.

In maximum clearance the hole has the maximum diameter and the shaft has the minimum diameter. In minimum clearance, the hole has minimum diameter and shaft has maximum diameter.

Example: Bush bearings and channel bearings are fitted with clearance fit.

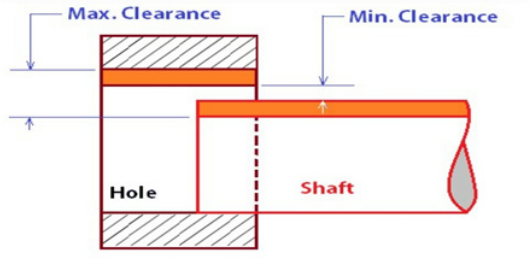


Figure 2 Clearance Fit

Interference Fit: If the size of the hole is smaller than the size of the shaft, then it is called as "interference Fit". This is also known as "press fit" or "friction fit". This results in two conditions. They are maximum interference and minimum interference.

In maximum interference, the hole has minimum diameter and the shaft has maximum diameter. In minimum interference, the hole has maximum diameter and the shaft has minimum diameter.

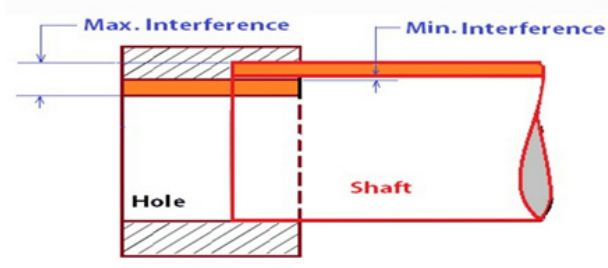


Figure 3 Interference Fit

Transition Fit: If the size of hole is equal to the size of shaft, then it is called as "Transition Fit". This is also known as "push fit" or "slip fit". These fits fall between clearance and interference fits and are suitable for situations in which accuracy is very important.

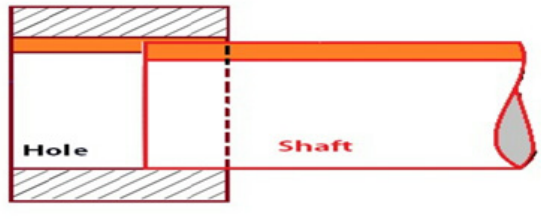
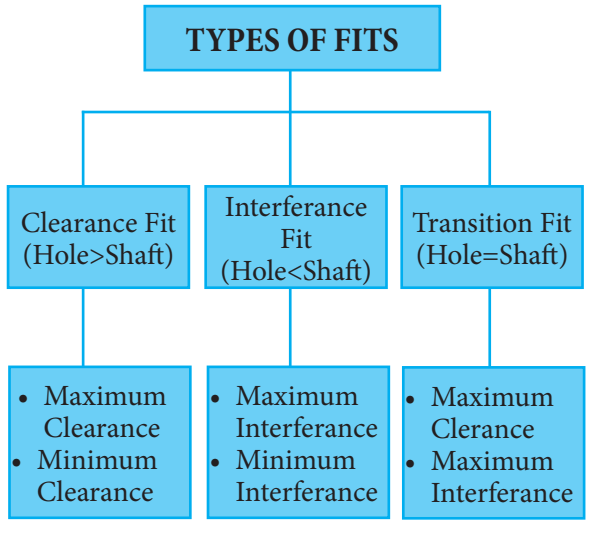


Figure 4 Transition Fit



4.4.2. Systems of fit

To determine the fit, we must take one component as the constant member and the second component will have the deviations according to the type of fit chosen.

By making a constant member we can classify them as hole basis system and shaft basis system. These are the two bases of the limit system.

Hole Basis System

In a hole basis system, the hole is kept as the constant, and the shaft upper and lower deviation values determine the type of fit. In a hole basis system, the Lower deviation of the hole will be Zero.

Example:

Nominal Size of Hole 36mm
Hole = 36.000⁄36.015

(Clearance Fit) Shaft = 35.980/35.990
(Maximum Clearance = 0.035; Minimum Clearance = 0.010)

(Transition Fit) Shaft = 35.990/36.010
(Maximum Clearance = 0.030; Maximum Interference = 0.010)

(Interference Fit) Shaft = 36.010/36.020
(Maximum interference = 0.020; Minimum Interference = 0.005)

Shaft Basis System

In the Shaft basis system, the shaft is kept as the constant, and hole upperand lower deviation values determine the type of fit. In the shaft basis system, the upper deviation of the shaft will be Zero.

Example:

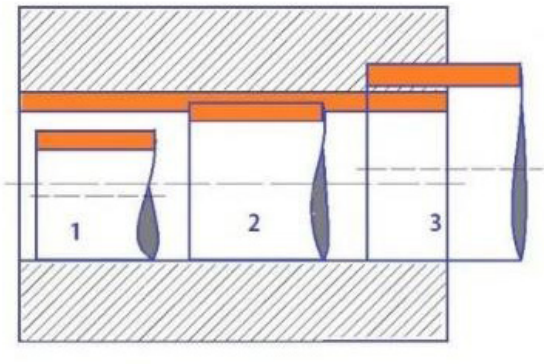
Nominal Size of shaft 25mm
Shaft = 24.985/25.000

(Clearance Fit) Hole = 25.010/25.020
(Maximum Clearance = 0.035; Minimum Clearance = 0.010)

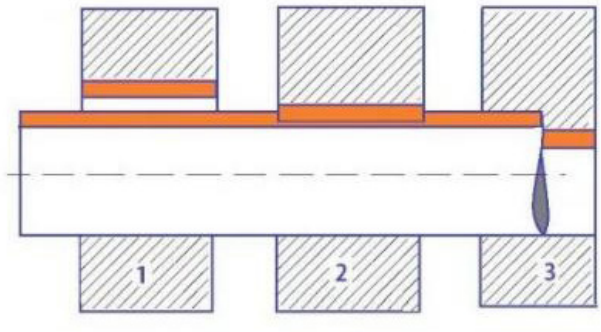
(Transition Fit) Hole = 24.990/25.010
(Maximum Clearance = 0.025; Maximum Interference = 0.010)

(Interference Fit) Hole = 24.980/24.990
(Maximum interference = 0.020; Minimum Interference = 0.005)

Out of these two bases of limits systems, hole basis system is preferred over shaft basis system due to from manufacturing perspective it is easy to adjust the shaft dimension by using grinding or turning operation whereas holes are produced with drilling operations and it becomes complicated to do any further turning or grinding operations in holes.



Hole Basis System



Shaft Basis System

1. Clearance 2. Transition 3.Interference

4.5. INTERNATIONAL ORGANISATION FOR STANDARDIZATION (ISO)

The ISO plays and important role in facilitating world trade by providing common standards among different countries. These standards are intended to ensure that products and services are safe, reliable and of good quality.

Functions of ISO

1. Make the technical development, manufacturing and supply of products and services more efficient, safer and cleaner.
2. Make the trades and marketing easier between countries.
3. Provide governments with a technical base for halth and consumer goods.

4.6. BUREAU OF INDIAN STANDARDS

The bureau of Indian standards (BIS) is the national level organization. (Formerly known as "Indian standards institution). Its main objective is create quality standards for consumer and industrial products. We found ISI symbol on many Indian products. It is a certification mark given by the BIS. A producer who wants to adopt a standard for his product has to obtain ISI symbol from BIS.

BIS was established by the bureau of Indian standard ACT 1986 which came into effect on 23 December 1986. BIS provides quality assurance of goods produced in India. BIS is responsible for standardization and certification of Indian products.

Functions of BIS

1. BIS gives quality standards for consumer and industrial goods national level.
2. It gives quality certification of goods and "ISI"
3. BIS provides assurance for any product's quality, reliability and safety to the consumers.

Glossary

1. Standardization	தரநிர்ணயம்
2. Interchangeability	பொருந்தும் தன்மை
3. Tolerance	ஏற்கப்படும் அளவு வேறுபாடு
4. International Organisation for Standardization(ISO)	சர்வதேச தரநிர்ணய நிறுவனம்
5. Bureau of Indian Standards(BIS)	இந்திய தரநிர்ணய நிறுவனம்

Activities

1. Visit near industry and look out for some-time in the inspection department.
2. Take and assemble the same make and model of pen parts.

QUESTIONS

PART A

I. Choose the correct option :

1. The system that enables parts of equivalent sizes with dimensional variation within certain limits to be fit operating is
   a) Limits
   b) Unilateral
   c) Deviation
   d) Interchangeability

2. If the size of the hole is smaller than the size of shaft, then type of fit is
   a) Interference fit
   b) Clearance fit
   c) Transition fit
   d) Slip fit

3. If the size of the hole is larger than the size of shaft, then type of fit is called as
   a) Interference fit
   b) Clearance fit
   c) Transition fit
   d) Slip fit

4. The algebraic difference between the actual size and its corresponding basic size is called
   a) Maximum limit
   b) Deviation
   c) Tolerance
   d) Minimum limit

5. If accuracy is very important, what type of fit you have choosen
   a) Interference fit
   b) Clearance fit
   c) Transition fit
   d) Friction fit

PART B

II. Answer the following questions in one or two sentences:

6. Define 'Interchangeability'?
7. What do you mean by limits of size?
8. What is fit?
9. What is 'Basic Size'?
10. Write short notes on the types of deviations?
11. What are the functions of ISO?
12. What are the functions of BIS?

PART C

III Answer the following questions in about a page?

13. What is tolerance? Explain its types.
14. Explain about the systems of fit

PART D

IV. Answer the following questions in detail:

15. Explain the basic terminology used in interchangeability?
16. Explain the different types of fits?