高职高专机械设计与制造专业规划教材

机电与数控专业英语

石金艳　谢永超　主　编
范芳洪　副主编

赠送
电子课件

本书特色

- 理论联系实践，图文并茂，案例丰富，实用性强。
- 紧跟新技术的发展，包含现代制造业中的新技术，如CAD/CAM/FMS/CIMS及新材料和新工艺。
- 内容全面，涵盖机械设计与制造、机电一体化、数控技术应用专业的重点知识，便于各类学校根据不同专业灵活选用。
- 配备大量练习题及与主题紧密关联的专业阅读文章，提升专业英语阅读能力、信息获取能力和翻译能力。

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内 容 简 介

本书主要介绍了机电技术专业与数控技术专业有关的专业英语知识，本书内容紧密结合专业知识，行文流畅，具有较强的趣味性，可起到巩固专业课教学内容的作用。全书共分 12 个单元，内容包括工程制图、机械零件、工程材料及其性能、机构的设计与选用、数字控制、数控操作、机床、计算机辅助设计、计算机辅助制造与柔性制造系统、计算机集成制造系统、非传统加工工艺和对话练习。为了训练学习者的英语阅读能力以及对英语文章信息的获取能力，各单元均有一定数量的配套习题。此外，每个单元还配有参考译文便于学习者的学习。

本书可作为高等职业院校机电一体化类专业、数控技术应用类专业的教材，也可作为机械制造及自动化领域相关技术人员的自学参考用书，同时还可以作为成人教育或培训班的培训用书。

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前　言

随着我国机械装备制造业的迅速发展，中国机械装备制造业在世界范围内的影响越来越广泛，中国与世界的技术交流越来越紧密。因此，掌握一定的专业英语知识，提升专业英语阅读能力，对学习国际先进的机械制造、数控加工技术等有着举足轻重的作用。

作为高职院校的一门课程，专业英语课程同其他课程一样，也要注重实践性和应用性。本书在编写过程中，主要体现以下特色。

(1) 紧跟新技术的发展，介绍了现代制造业中的一些较新技术，例如，CAD/CAM/FMS/CIMS，以反映内容的先进性。

(2) 理论联系实践，多介绍方法和案例，如机械零件、工程材料、数控操作、非传统加工工艺等内容是为工程技术人员在实践工作中随手查阅而备，使本书更具实用性。

(3) 本书采用大量图表，图文并茂，便于读者理解记忆。

(4) 本书共有 12 个单元，分别介绍了机电一体化专业、数控技术应用专业的重点知识，便于各类学校根据不同专业侧重点加以灵活选用。

(5) 本书每个单元均有大量配套的练习题及一篇与主题紧密关联的专业阅读文章。通过练习题，可以提高学习者对专业英语信息的获取能力；通过专业阅读的训练，能够提升学习者的快速阅读能力。此外，本书还对每个单元中一些典型的难句、长句进行了分析讲解，有助于学习者掌握一些专业英语的翻译技巧。

本书由湖南铁道职业技术学院石金艳、谢永超担任主编，范芳洪担任副主编。

本书在编写过程中，参考了相关的著作及资料，同时也得到了很多专家、学者的热情帮助，在此一并表示衷心感谢。

本书虽经过多次校对，但因时间仓促，加上编者水平有限，书中难免存在不足之处，恳请广大师生和读者批评指正！

编　者

目　录

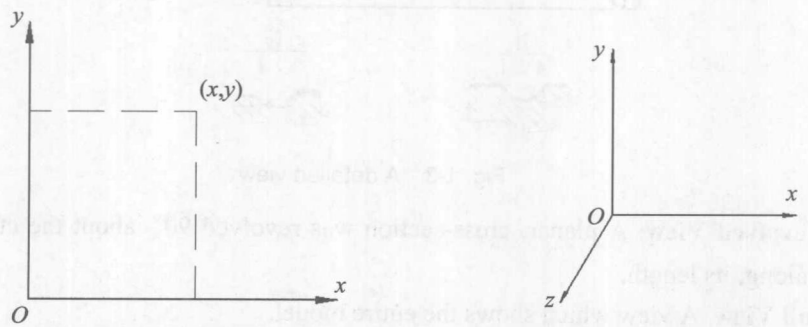
Unit 1 Engineering Drawing

The graphics are important media carrying the information to communicate, as the written words, voice, images do. Engineering drawing mainly based on graphics is the main tool used to express the design ideas in engineering design, manufacturing and construction process, known as "the language of engineering".

1.1 Coordinate System

In engineering drawing, the coordinate system is very important. The basic of all inputs in AutoCAD is the Cartesian coordinate system, and the various input (absolute or relative) rely on this system. In addition, AutoCAD has two internal coordinate systems to help you keep track of where you are in a drawing: the World Coordinate System (WCS) and the User Coordinate System (UCS).

The fixed Cartesian coordinate system locates all points on an AutoCAD drawing by defining a series of positive and negative axes to locate positions in space. Figure 1-1(a) illustrates the axes for two-dimension (2D) drafting. There is a permanent origin point (0,0) which is referenced, an *x* axis running horizontally in a positive and negative direction from the origin, and a *y* axis traveling perpendicularly in a vertical direction. When a point is located, it is based on the origin point unless you are working in the three dimension, in which case you will have a third axis, called the *z* axis (see Fig. 1-1(b)).



(a) Two dimension (b) Three dimension

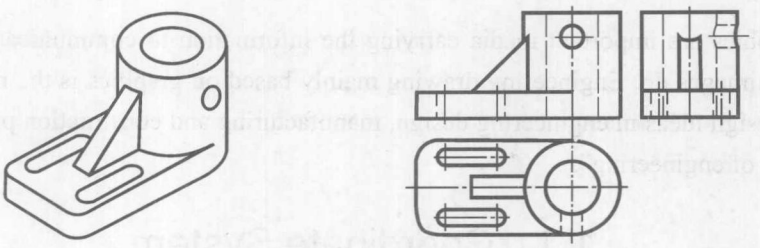
Fig. 1-1 The coordinate system

1.2 Types of Views

Many types of views are used to express the design ideas in engineering design in the area of Engineering drawing.

(1) **Projection View**. An orthographic projection of an object as seen from the front, top,

right side, etc, as illustrated in Fig. 1-2. Fig. 1-2 (a) is the object, and Fig. 1-2 (b) is the orthographic projection of the object.



(a) An object (b) Orthographic projection of the object

Fig. 1-2 An orthographic projection of an object

(2) **Auxiliary View**. Any view created by projecting 90° to an inclined surface, datum plane, or along an axis.

(3) **General View**. Any view which is oriented by the user and is not dependent on any other view for its orientation.

(4) **Detailed View**. Any view which is derived by taking a portion of an existing view and scaling it for the purpose of dimensioning and clarification. The following Fig. 1-3 is a typical example of detailed view. There are two detailed views in Fig. 1-3, that is, Ⅰ and Ⅱ.

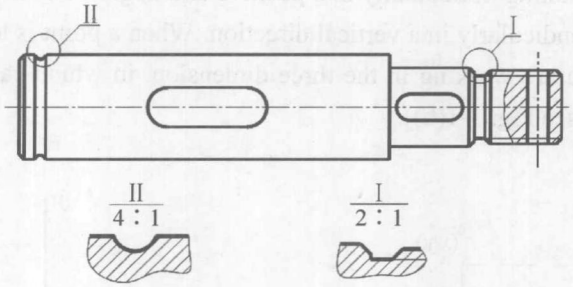


Fig. 1-3 A detailed view

(5) **Revolved View**. A planar, cross-section was revolved 90° about the cutting plane line and offset along, its length.

(6) **Full View**. A view which shows the entire model.

(7) **Half View**. A view which shows only the portion of the model on one side of a datum plane.

(8) **Broken View**. Used on large objects to remove a section between two points and move the remaining section close together.

(9) **Section View**. A view which displays a cross-section for a particular view, as shown in Fig. 1-4.

(10) **Exploded View**. The exploded view is a type of pictorial drawing designed to show several parts in their proper location prior to assembly. Although the exploded view is not used as

the working drawing for the machinist, it has an important place in mechanical technology. Exploded views appear extensively in manuals and handbooks that are used for repair and assembly of machines and other mechanisms.

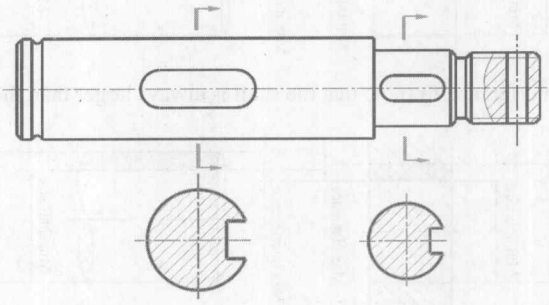
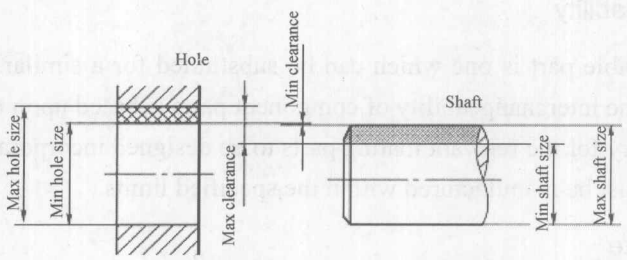


Fig. 1-4 A section view

(11) **Partial View**. When a symmetrical object is drafted, two views are sufficient to represent it (typically, one view is omitted). A partial view can be used to substitute one of the two views. Section and auxiliary views are also commonly used to present part detail. Section views are extremely useful in displaying the detailed design of a complicated internal configuration. If the section is symmetrical around a centerline, only the upper half needs to be shown. The lower half is typically shown only in outline. Casting designers often employ section views to explode detail. When a major surface is inclined to three projection planes, only a distorted picture can be seen. An auxiliary plane that is parallel to the major surface can be used to display an undistorted view.

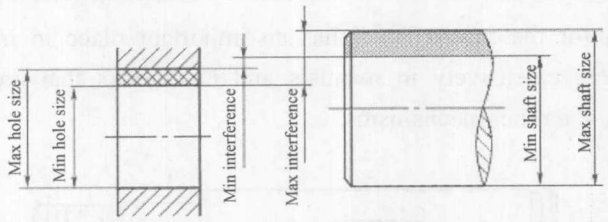
1.3 Fits

The fit between two mating parts is the relationship which results from the clearance or interference obtained. There are three classes of fits, namely, clearance, transition and interference. These conditions are shown in the following Fig. 1-5.

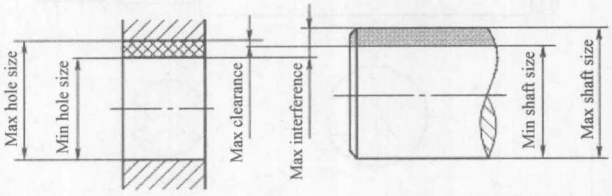


(a) Clearance fit (note that the shaft is always smaller than the hole)

Fig. 1-5 Classes of fits between a hole and a shaft



(b) Interference fit (note that the shaft is always larger than the hole)



(c) Transition fit (note that the limits are such that the condition may be of clearance or interference fit)

Fig. 1-5 Classes of fits between a hole and a shaft(continued)

The following Fig. 1-6 is a typical example of the dimensioning of fit code in the assembly drawing.

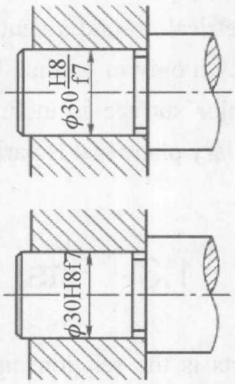


Fig. 1-6 A typical example of the dimensioning of fit code in the assembly drawing

1. Interchangeability

An interchangeable part is one which can be substituted for a similar part manufactured to the same drawing. The interchangeability of component parts is based upon two functions:

(1) It is necessary for the relevant mating parts to be designed incorporating limits of size.

(2) The parts must be manufactured within the specified limits.

2. Limits of Size

In deciding the limits necessary for a particular dimension, there are three consideration: functional importance, interchangeability and economics. The first necessitates a knowledge of what the component is required to do, the second its replacement in the event of failure, and the third the avoidance of unnecessary time and money being spent in production. The decision as to

the degree of tolerance that can be utilized calls for discretion in the compromise between accuracy and economy. In order to assist the designer in his choice of limits and fits and to encourage uniformity throughout industry (home and abroad), a number of limit-and-fit systems have been published.

Words and Expressions

coordinate [kəu'ɔ:dineit]	坐标，坐标系
coordinate system	坐标系
coordinate value	坐标值
Cartesian [kɑ:'ti:ziən]	笛卡儿
Cartesian coordinate system	笛卡儿坐标系
keep track of	跟踪定位于
World Coordinate System (WCS)	世界坐标系
User Coordinate System (UCS)	用户坐标系
perpendicularly [ˌpə:pən'dikjuləli]	与……垂直
projection [prə'dʒekʃən]	投影，计划，设计
orthographic projection	正交投影
projection drawing	投影图
projection plane	投影面
projection method	投影法
inclined surface	斜面
inclination [ˌinkli'neiʃən]	倾斜，斜度，倾角
datum plane	基准面
datum dimension	基准标注
general drawing	总图
detail ['di:teil]	局部放大图
planar ['pleinə]	平面的，二维的
planar graph	平面图
planar construction	平面结构
offset ['ɔfˌset]	偏置，偏移
partial ['pɑ:ʃəl]	局部的，图示的
partial view	局部视图
exploded view	分解图，爆炸图
symmetrical [si'metrikəl]	对称的
asymmetrical [ˌeisi'metrikl]	不对称的
section view	剖视图，剖面图
mate [meit]	配合
orient ['ɔ:riənt]	定向，定位

orienting line		基线
orienting point		基点
clearance	['kliərəns]	间隙
transition	[træn'ziʃən]	过渡
interference	[ˌintə'fiərəns]	过盈

Notes

(1) The basic of all inputs in AutoCAD is the Cartesian coordinate system, and the various inputs (absolute or relative) rely on this system.

The basic of … 在此的意思是“……的基础”，rely on 的意思是“依赖，依靠”。

本句可以翻译为：笛卡儿坐标系是 AutoCAD 中所有输入的基础，各种输入方法(如绝对坐标、相对坐标)都依赖于这个系统。

(2) When a point is located, it is based on the origin point unless you are working in the three dimension, in which case you will have a third axis, called the *z* axis.

unless 引导让步状语从句，in which case 引导的从句在此作定语修饰 dimension，called the *z* axis 在此作为 third axis 的后置定语。

本句可以翻译为：根据原点(0,0)标记其他任意一个点，但是在三维空间中绘图时，应该有第三根轴，称为 *z* 轴。

(3) Section and auxiliary views are also commonly used to present part detail.

to present part detail 作目的状语。

本句可以翻译为：剖面图和辅助视图也经常用于表达零件细节。

(4) An interchangeable part is one which can be substituted for a similar part manufactured to the same drawing.

interchangeable 在此为动词 interchange 的形容词形式，翻译为“可以互换的，可交换的”。

substitute for 在此意思是“代替，替换，取代”。

本句可以翻译为：可互换的零件是一种能由同一图纸加工出来的相似零件所代替的零件。

(5) In deciding the limits necessary for a particular dimension, there are three consideration: functional importance, interchangeability and economics.

本句可以翻译为：对一个具体尺寸给定公差带时，需要考虑三个方面：功能重要性、可互换性和经济性。

Exercises

1. Answer the following questions according to the text above.

(1) What is the Cartesian coordinate system and its function?

(2) How many types of views are there according to our text? Give their names.

(3) What is the detailed view and its function?

(4) How many types of fits are there according to our text? Give their names.

(5) What needs to be considered while deciding the limits necessary for a particular dimension?

2. Fill in the blanks with proper words or phrases according to the text (note the proper tense).

(1) AutoCAD has two internal coordinate systems, they are _____ and _____.

(2) There are many types of views in the text, namely_____, _____, _____, _____, _____, _____, _____, _____, and_____.

(3) There are three classes of fits, namely_____, _____, and_____.

3. Translate the following expressions into Chinese.

(1) Coordinate system

(2) Cartesian coordinate system

(3) Keep track of

(4) World Coordinate System (WCS)

(5) User Coordinate System (UCS)

(6) Orthographic projection

(7) Projection plane

(8) Partial View

(9) Degree of tolerance

(10) Home and abroad

4. Translate the following sentences into Chinese.

(1) AutoCAD has two internal coordinate systems to help you keep track of where you are in a drawing: the World Coordinate System (WCS) and the User Coordinate System (UCS).

(2) The fixed Cartesian coordinate system locates all points on an AutoCAD drawing by defining a series of positive and negative axes to locate positions in space.

(3) There is a permanent origin point (0,0) which is referenced, an x axis running horizontally in a positive and negative direction from the origin, and a y axis traveling

perpendicularly in a vertical direction.

(4) The first necessitates a knowledge of what the component is required to do, the second its replacement in the event of failure, and the third the avoidance of unnecessary time and money being spent in production.

5. Write a 100-word summary according to the text.

课文参考译文

第 1 单元　工程制图

图形和文字、声音、图像一样，是承载信息进行交流的重要媒体。以图形为主的工程图样是工程设计、制造和施工过程中用来表达设计思想的主要工具，被称为“工程界的语言”。

1.1　坐标系

在工程制图中，坐标系是十分重要的。笛卡儿坐标系是 AutoCAD 中所有输入的基础，各种输入方法(如绝对坐标、相对坐标)都依赖于这个系统。此外，AutoCAD 有两个内部坐标系：世界坐标系(WCS)和用户坐标系(UCS)，用来帮助确定你在绘图区中的位置。

固定的笛卡儿坐标系可以通过定义一系列用以确定空间位置的正负轴来标记 AutoCAD 图上的所有点。图 1-1(a)所示为二维绘图的坐标系。坐标系有一个作为参考点的固定原点(0,0)，x 轴从原点出发沿着水平方向向左右延伸，y 轴从原点出发沿着垂直方向上下延伸。根据原点(0,0)标记其他任意一个点，但是在三维空间中绘图时，应该有第三根轴，称为 z 轴，如图 1-1(b)所示。

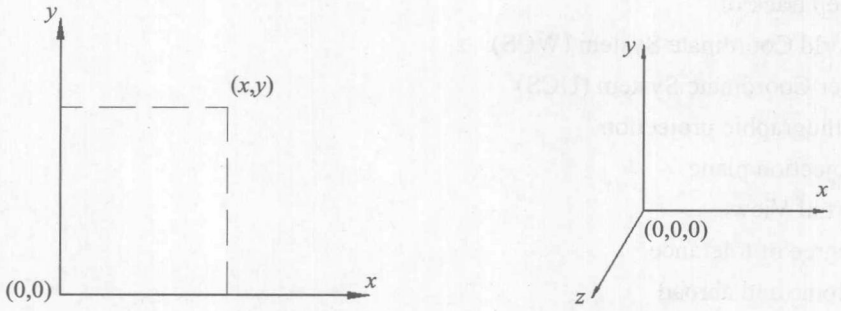


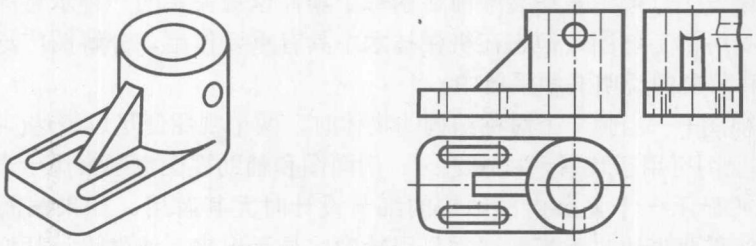
图 1-1　坐标系

1.2　视图类型

在工程制图领域，采用各种视图类型来表达机械设计的设计理念。

(1) **投影视图**——是从前面、顶面、右侧面等方向观察物体的正交投影图，如图 1-2 所示。图 1-2(a)为物体的实物图，图 1-2(b)为物体的正交投影图。

(2) **辅助视图**——向倾斜面、参考面或沿着一个轴线作 90° 投影所产生的视图。



(a) 物体　　(b) 物体的正交投影图

图 1-2　一个物体的正交投影

(3) **总图**——由用户确定位置，并且其定向不依赖于其他定位视图的视图。

(4) **局部放大图**——为了标注尺寸和看清图形而从已知视图中取出一部分并将其放大的一种视图。图 1-3 是一幅局部放大图的典型例子。图 1-3 中有两处用到了局部放大图，分别为Ⅰ处和Ⅱ处。

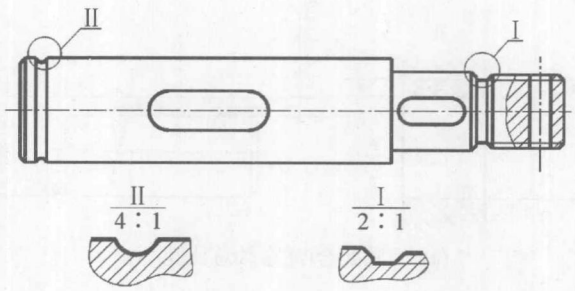


图 1-3　局部放大图的典型例子

(5) **旋转视图**——二维平面中，横截面绕剖切线旋转 90° 后移出一定距离的视图。

(6) **全视图**——显示整个模型的视图。

(7) **半视图**——只显示在参考面一侧的部分图形。

(8) **折断视图**——用于表达大的物体，移去(中间)两点间的一段截面并把剩余部分移到一起的截面视图。

(9) **剖面图**　用于显示某个视图的横截面，如图 1-4 所示。

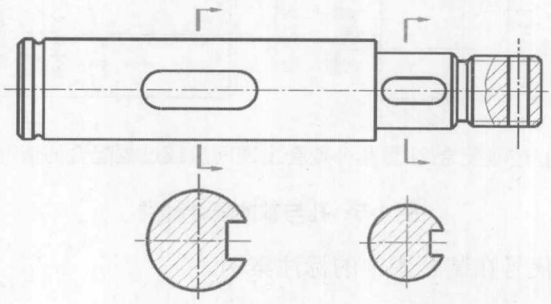


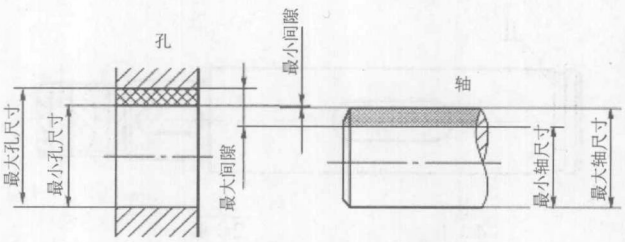
图 1-4　剖面图

(10) **分解图**——分解图是在装配前显示每个零件位置关系的一种示意图。尽管机械师不把部件分解图用作工作图，但它在机械技术中具有重要作用。分解图广泛出现在机器或机械装置维修和装配的说明书和手册中。

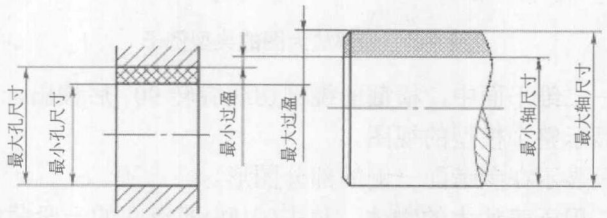
(11) **局部视图**——当画一个对称结构的物体时，两个视图便足以表达(习惯上一个视图被省略)。局部视图可用于代替两视图之一。剖面图和辅助视图也经常用于表达零件的局部细节。剖面图在显示一个复杂内部结构的细节设计时尤其有用。如果截面沿着中心线对称，只有上半部需要表达。下半部通常只用轮廓线显示出来。铸件设计师们通常利用截面图来分解局部。当一个主要面倾斜于三个投影面时，只能看到歪曲了的图形，一个平行于该主要面的辅助平面，可用来显示物体未被歪曲的视图。

1.3 配合

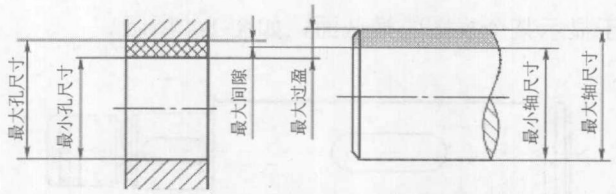
两个相互匹配的零件之间的配合是一种由间隙或过盈导出的关系。配合有三种类型，即间隙配合、过渡配合和过盈配合，如图 1-5 所示。



(a) 间隙配合(注意轴总比孔小)



(b) 过盈配合(注意轴总比孔大)



(c) 过渡配合(注意其公差会出现间隙或过盈配合的情况)

图 1-5 孔与轴的配合种类

图 1-6 所示为配合代号在装配图中的标注案例。

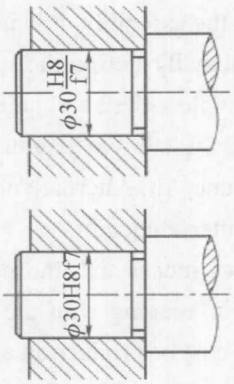


图 1-6 配合代号在装配图中的标注案例

1. 可互换性

可互换的零件是一种能由同一图纸加工出来的相似零件所代替的零件。零件的互换性要基于两个功能。

(1) 对于相互配合的零件来说，设计成融合的尺寸公差是十分必要的。

(2) 必须在指定的公差内制造零件。

2. 尺寸公差

对一个具体尺寸给定公差带时，需要考虑三个方面：功能重要性、可互换性和经济性。第一，有必要了解这个元件的用途；第二，要了解失效场合下它的替换性；第三，要考虑避免在生产上花费不必要的时间和金钱。至于决定采用何种可行的公差等级，则要在精确性与经济性之间评判协调。为帮助设计者选择公差与配合以及鼓励整个工业界的一致性(国内和国外)，已经发布了许多公差与配合系统。

Technical Reading

Dimension and Tolerance

In deciding a drawing, the numbers placed in the dimension lines represent dimensions that are only approximate and do not represent any degrees of accuracy unless so stated by the designer. The numbers are termed as nominal size. The nominal size of a component dimension is arrived at as a convenient size based on the design process. However, it is almost impossible to produce any component to the exact dimension through any of the known manufacturing processes. Even if a component is perceived to be made to the exact dimension by manual process, the actual measurement with a high resolution measuring device will show that this is an incorrect perception. It is therefore customary in engineering practice to allow a permissible deviation from the nominal size, which is termed as tolerance. Tolerance on a dimension can also specify the degree of accuracy. For example, a shaft might have a nominal size of 53.5 mm. If a variation of ±0.06 mm could be permitted, the dimension would be stated 53.5±0.06 mm.

In engineering, when a product is designed, it consists of a number of parts and these parts