

# ESP

● 专门用途英语系列教材

## 数控技术英语

### *English for Numerical Control Technology*

《数控技术英语》教材编写组 编



高等教育出版社

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***English for  
Numerical Control  
Technology***

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## 内容提要

专门用途英语系列教材是教育部规划的高等学校(包括高等专科院校和高等职业院校)专业英语阶段的英语教材,也可供电大、各类成人院校及广大专业人员学习专业英语、提高涉外业务交际能力使用。本书是该系列教材之一,旨在提高数控类专业学生和数控行业从业人员学习专业英语及涉外业务人员的交际能力。

《数控技术英语》是根据《高职高专教育英语课程教学基本要求(试行)》组织编写的。依照高职高专的培养目标及其教学的实际情况,本书更注重“边学边用,学用结合”的原则。内容系统、全面,难点、重点突出,并力求实用、先进、通俗、易懂。

全书包括10个单元,每个单元都加入了一些与工厂紧密结合的实用英语例题,同时还设有数控实用英语对话等,书后附有练习参考答案和课文参考译文。

本书既可作为高职、高专、成人高校及本科院校的数控技术及应用、机电一体化等专业的专业英语教材,也可用作企业培训的教材,或相关专业教师、学生及技术人员的学习参考书。

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# 前 言

专门用途英语系列教材是教育部规划的高等学校专业英语阶段的英语教材。本系列教材从培养高级应用型人才的总体目标出发,结合学生毕业后的工作实际,力求向学生提供其未来工作岗位所需要的专业英语知识和技能,培养学生使用涉外业务英语的能力。

本系列教材每册书都由10个单元组成,每单元包括阅读与翻译、模拟套写和听力与会话等内容。

本系列教材主要供高等院校(包括高等专科学校和高等职业院校)专业英语教学使用,也可供电大、各类成人院校及广大专业人员学习专业英语,提高涉外业务交际能力使用。

《数控技术英语》是本系列教材中的一种,是根据《高职高专教育英语课程教学基本要求(试行)》组织编写的。

《数控技术英语》编写的宗旨是以人才市场为导向,以提高学生的职业能力和职业素质为目的,结合专业英语的特点,编写出机械工程,尤其是数控技术方面的专业英语。本书突出数控专业的词语和用法,以典型数控系统的编程和操作英文说明书为主要参考文献,以英文阅读理解、翻译和资料查询为重点,使学生获得阅读和查阅数控机床、数控系统操作与编程英文说明书等的的能力。

本教材共10个单元,供一个学期使用。每个单元包括5个部分:

第一部分为“专业阅读”(Technical and Practical Reading),旨在培养学生阅读数控专业英语的能力。本部分包括两篇文章,所收入的文章能阐述当今数控专业方面的最新高科技机床和加工工艺等,同时配有一些先进的数控机床照片。

第二部分为“了解控制面板”(Glance at a Control Console),目的是要求学生能看懂数控机床的操作面板的功能使用。当今数控机床千变万化,但其操作面板变化不是大的,只要学生了解了面板上每个键的功能与作用,就能在工厂实际中得以应用。

第三部分为“模拟套写”(Simulated Writing),它包括两部分,Section A为数控常用故障诊断;Section B为数控小零件程序设计。旨在培养学生根据所学数控专业知识,直接参照范例进行套写、拟写和翻译产品广告、机床说明书、数控系统操作与编程说明书等应用文。

第四部分为“交际会话”(Communicative Speaking),旨在培养学生的专业英语的口头交际能力。

第五部分为“开拓眼界”(Broaden Your Horizon — Get to Know More of the World Famous Companies),其主要意图是让学生了解世界著名的数控机床生产厂家,介绍他们的发展历史、生产规模、产品状况以及目前的经营情况等,让学生开拓视野。

本书构思力求实用性强,选材新颖,贴近企业,靠近专业,重点突出和针对性强;尤其在第三部分的“模拟套写”和练习的编排,包括突出了专业英语的特色,设计独创,采取一种全新的方式,让

学生通过练习,既能学到英语,又能学到数控方面的小知识,“故障诊断(Common Failure Diagnostics)”和“试试你的身手(Have a Try)”,可谓一举两得。

本书的总主编为大连理工大学孔庆炎教授;长春汽车工业高等专科学校黄星为本书的主编。

长春汽车工业高等专科学校黄星编写了第1~4单元,长春汽车工业高等专科学校赵九九编写了第5~8单元,吉林公安高等专科学校邱丽杰编写了第9单元,吉林省万嘉翻译有限公司总经理崔永波编写了第10单元。

本书在编写过程中得到了李若林主任、刘万菊教授、王凤蕴副教授、杨春生副教授、赵长明副教授等专业老师的大力支持,他们提出了许多涉及数控技术方面的相关宝贵意见和建议。刘永久、王伟罡等老师提供了大量的数控技术方面的最新资料,使本书能够顺利完成。对他们们的热情帮助以及无私奉献,编者在此深表谢意。

由于本书想要突出数控技术英语方面的一些特色,因而在编写过程中采用了许多与众不同的编写方式。由于编者水平有限,书中难免会出现一些缺点和错误,恳请广大读者批评指正,在此表示深深的感谢。

编者  
2005年11月

## 郑重声明

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## 1

## UNIT

# Introduction to Numerical Control

## Part I

## Technical and Practical Reading

### ■ Passage A

#### Fundamentals of Numerical Control

Controlling a machine tool by means of a prepared program is known as numerical control, or NC. NC equipment has been defined by the Electronic Industries Association (EIA) as "A system in which actions are controlled by the direct insertion of numerical data at some point. The system must automatically interpret at least some portion of this data."

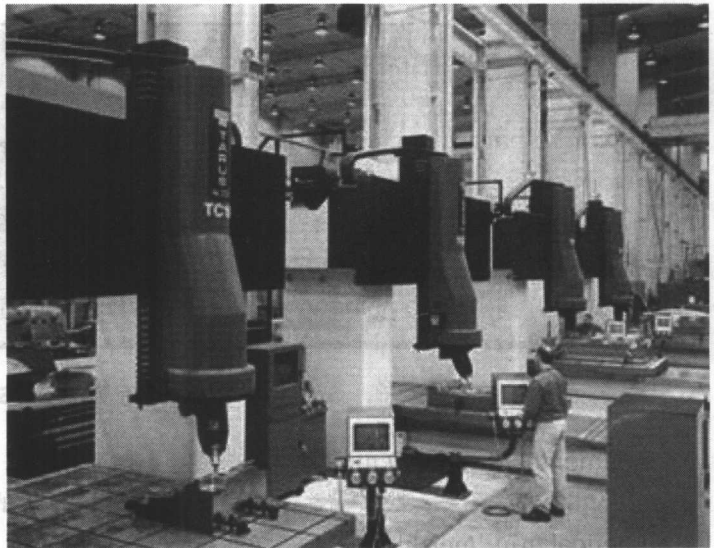
In a typical NC system the numerical data which is required for producing a part is maintained on a punched tape and is called the part program. The part program is arranged in the form of blocks of information, where each block con-

tains the numerical data required to produce one segment of the work-piece.<sup>1</sup> The punched tape is moved forward by one block each time the cutting of a segment is completed. The block contains, in coded form, all the information needed for processing a segment of the work-piece.

Compared with a conventional machine tool, the NC system replaces the manual actions of the operator. In conventional machining a part is produced by moving a cutting tool along a work-piece by means of hand-wheels, which are guided by an operator.

#### Advantages of NC System

Before, during and especially after World War II, the U.S. Air Force increasingly felt the need to



## 2 Unit 1 Introduction to Numerical Control

manufacture complicated and accurate aircraft parts, which were difficult to produce using conventional machine tools. The first steps in the development of a suitable machine tool were undertaken at the Parsons Company in Traverse City, Michigan, and it was completed by the Massachusetts Institute of Technology (MIT) Servomechanism Laboratory. By 1952 these research efforts had produced a NC milling machine, with these controlled axes,<sup>2</sup> which is believed to be the first successful NC machine. Thus, we see that the primary motivations for the development of NC systems for machine tools were the demand for high accuracy in manufacturing of complicated parts, combined with the desire to shorten production time.<sup>3</sup>

The accuracy is most important. Producing a part that has to be cut with an accuracy of 0.01 mm or better may take a considerable amount of time using conventional methods. The operator has to stop the cutting process frequently and measure the part dimensions in order to ensure that the material is not over-cut.

It has been proved that the time wasted on measurements is frequently 70 to 80 percent of the total working time. NC machines save that time, while maintaining or even improving the required tolerances.

### Notes

1. ...where each block contains the numerical data required to produce one segment of the work-piece. 由 where 引导出非限定性定语从句，修饰 blocks of information。
2. with these controlled axes, 此部分为介词短语作后置定语，with 的含义是“具有”。
3. we see that the primary motivations ..., combined with the desire to shorten production time. 此句中分词短语 combined with ... 结构，引导出伴随状语。

### New Words

fundamental /ˌfʌndə'mentəl/ *n.*

*a.*

numerical /ˈnjuː'merɪkl/ *a.*

insertion /ɪn'sɜːʃən/ *n.*

automatically /ˌɔːtə'mætɪkəli/ *ad.*

interpret /ɪn'tɜːprɪt/ *v.*

portion /'pɔːʃən/ *n.*

maintain /meɪn'teɪn/ *v.*

punch /pʌntʃ/ *v.*

block /blɒk/ *n.*

segment /'segmənt/ *n.*

code /kəʊd/ *n.*

*v.*

原理，基础

基本的，基础的

数的，数字的

插入，嵌入，放入

自动地，机械地

解释，说明

部分

维护，保养

穿孔，冲压

块，部分

部分，片，段，块

规则，密码，代码

编码

work-piece /'wɜ:kpi:s/ *n.*  
 manufacture /,mænʃʊ'fæktʃə(r)/ *v.*  
 undertake /,ʌndə'teɪk/ *v.*  
 axes /'æksɪz/ *n.*  
 motivation /,məʊtɪ'veɪʃən/ *n.*  
 accuracy /'ækjʊərəsɪ/ *n.*  
 considerable /kən'sɪdərəbl/ *a.*  
 frequently /'fri:kwəntli/ *ad.*  
 dimension /dɪ'menʃən, daɪ-/ *n.*  
 over-cut /'əʊvəkʌt/ *n.*  
 measurement /'meʒəmənt/ *n.*  
 total /'təʊtl/ *a.*  
 tolerance /'tɒlərəns/ *n.*

工件, 零件  
 制造, 生产, 加工  
 承担, 着手, 从事, 进行  
 轴, 轴线  
 推动, 激发, 动力  
 准确度, 精密度, 精确  
 值得考虑的, 重要的, 可观的  
 常常, 频繁地  
 尺寸, 尺度, 维(数)  
 过度切割, 切断  
 量, 测定, 测量  
 总计的, 完全的  
 公差, 容量

### Phrases and Expressions

by means of  
 be defined as  
 at least  
 demand for  
 be combined with  
 a conventional machine tool  
 Massachusetts Institute of Technology (MIT)  
 a NC milling machine

用..., 依靠  
 定义为  
 至少  
 对... 需求  
 与...结合, 与...分不开  
 常规 / 传统机床  
 麻省理工学院  
 数控铣床

### EXERCISE 1

Decide whether the following statements are True or False according to the passage.

1. Numerical control is designed to control the operation of a machine tool by a series of coded instructions called a program.
2. A part program is stored in the form of blocks of information, and each block has the numerical data needed to manufacture a segment of the work-piece.
3. Like a conventional machine tool, the NC system can't replace the manual actions of the operator either.
4. The introduction of a numerical control system into a machine tool was the demand for high accuracy in producing of complicated parts.
5. Numerically controlled machine tools do not save much time, but they can maintain or even improve the required tolerances.



## 4 Unit 1 Introduction to Numerical Control

**EXERCISE 2**

Translate the following phrases into Chinese or English.

- |                                |        |
|--------------------------------|--------|
| 1. NC                          | _____  |
| 2. _____                       | 穿孔纸带   |
| 3. the numerical data          | _____  |
| 4. _____                       | 手工操作   |
| 5. the part program            | _____  |
| 6. _____                       | 加工高精度  |
| 7. a conventional machine tool | _____  |
| 8. _____                       | 常规方法   |
| 9. the required tolerances     | _____  |
| 10. _____                      | 总的加工时间 |

**EXERCISE 3**

Fill in the blanks with the suitable words or phrases given below, changing the form where necessary.

punched tape, accuracy, machine tools, manual operation,  
NC system, part program, operator, milling machine

- Therefore, \_\_\_\_\_ are considered to be the typical form of programmable automation.
- Part programmers must be familiar with the functions of numerically controlled \_\_\_\_\_ and machining processes.
- They write the \_\_\_\_\_ manually or by using a computer-assisted language, such as APT.
- Joseph Jacquard developed a method to control textile looms by using a \_\_\_\_\_.
- Intelligence, clear thinking and good judgment are essential qualifications of a good NC machine \_\_\_\_\_.
- It is obvious that in machining the NC machine saves a considerable amount of time and improves the accuracy of \_\_\_\_\_.
- In the \_\_\_\_\_ the X and Y axes are horizontal.
- Moreover, since in NC the \_\_\_\_\_ is repeatable, inspection time is also reduced.

**EXERCISE 4**

Translate the Chinese parts given in the brackets into English.

- My secretary tells me that \_\_\_\_\_ (你了解一下关于数控方面的情况).
- What I can do is that \_\_\_\_\_ (我可以给你简要介绍一下这个领域里的各专业).
- Do you think that \_\_\_\_\_ (最古老的一个机械工程领域是机械设计)?
- First, we need to know \_\_\_\_\_ (在该工厂中使用数控机床的目的).

5. If we know the loads that this machine will carry, we \_\_\_\_\_ (才能最有效地利用我们所有的原材料).

## ■ Passage B

### Use of Microcomputers in NC Systems

The use of microcomputers in NC systems is well established. Briefly, the variable to be controlled (temperature, position, etc.) is monitored and the output from the **sensor** monitoring this variable **subtracted** from a reference signal. The different signal resulting from the **comparator** is a measure of error, called the **actuating** signal, which is used as an input to the process.

传感器 / 减去  
比较器  
激励

A microcomputer can be used as the controller, which is referred to as direct digital control (DDC).<sup>1</sup> The motor speed is the variable to be controlled. The **tachometer** acts as a speed **transducer**, generating a voltage **proportional** to speed. The comparator is an electronic device. If the speed is low for any reason, the actuating signal is positive, causing the **amplifier** to feed more current to the motor which increases the **torque** and therefore the speed. If the speed is too high the actuating signal is **negative** and the motor reduces torque and slows down. Clearly a stable operating speed will be reached when the **tacho-voltage** is roughly equal to the reference voltage.

测速计 / 转换器  
成正比的  
放大器  
力矩  
负的

The advantages to be gained from the use of microcomputers are (1) **regulation against unwanted disturbances**; (2) indirect control of what may be a high power by the low power reference signal; (3) a reduction in the undesirable effects of **nonlinearities**.

测速电压

干扰

The output from the transducer is sampled at regular **intervals** of time close enough together so that the output cannot change **appreciably** between samples. This information is converted to the binary form by an ADC<sup>2</sup> and stored by the computer. And the reading entered into the computer is used by a program which subtracts it from a reference number to create a digital **equivalent**. This number is the output from the computer to a DAC<sup>3</sup> which produces a proportional voltage which stays constant until reset.

非线性  
间隔  
明显地

等值





**Notes**

- |                                   |         |
|-----------------------------------|---------|
| 1. DDC: direct digital control:   | 直接数字控制器 |
| 2. ADC: analog digital converter: | 模拟数字转换器 |
| 3. DAC: digital analog converter: | 数字模拟转换器 |

**EXERCISE 5**

Abbreviations are very useful in practical work. Do you know the following English abbreviations you often come across in handling Numerical Control machine tools? Read them and then translate them into corresponding Chinese terms.

- |        |                          |       |
|--------|--------------------------|-------|
| 1. NC  | Numerical Control        | _____ |
| 2. BLU | Basic Length-unit        | _____ |
| 3. ATC | Automatic Tool Changer   | _____ |
| 4. ADC | Analog Digital Converter | _____ |
| 5. DAC | Digital Analog Converter | _____ |
| 6. DDC | Direct Digital Control   | _____ |
| 7. RAM | Random Access Memory     | _____ |
| 8. CPU | Central Processing Unit  | _____ |

**Part II****Glance at a Control Console**

The following is the External Machine Control Panel (CRT/MDI Panel). Read it and translate the English terms into Chinese.

Sample

