



**МИНИСТЕРСТВО ОБРАЗОВАНИЯ НОВОСИБИРСКОЙ ОБЛАСТИ
ГОСУДАРСТВЕННОЕ БЮДЖЕТНОЕ ПРОФЕССИОНАЛЬНОЕ
ОБРАЗОВАТЕЛЬНОЕ УЧРЕЖДЕНИЕ НОВОСИБИРСКОЙ ОБЛАСТИ
«НОВОСИБИРСКИЙ КОЛЛЕДЖ
ПРОМЫШЛЕННЫХ ТЕХНОЛОГИЙ»
(ГБПОУ НСО «НОВОСИБИРСКИЙ КОЛЛЕДЖ
ПРОМЫШЛЕННЫХ ТЕХНОЛОГИЙ»)**

**Measuring instruments
Types of linear measurements
Измерительные приборы.
Типы линейных измерений**

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Методическое пособие на английском языке
для студентов 3-4 курсов по специальности:

**27.02.07 "Управление качеством продукции, процессов и услуг
(по отраслям)"**

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Методическое пособие предназначено для работы на уроках английского языка и ознакомление студентов с техническими терминами относящихся к теме «Measuring instruments»

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1. Introduction (Пояснительная записка)

Настоящее пособие учебной дисциплины иностранный язык (английский язык) разработано на основе Федерального государственного образовательного стандарта (ФГОС) по специальностям среднего профессионального образования (СПО) специальности 27.02.07 "Управление качеством продукции, процессов и услуг (по отраслям) и предназначено для студентов 3-4 курсов.

Цель пособия – подготовить студентов к чтению и переводу на русский язык текстов технического содержания средней трудности.

В текстах содержится лексика и грамматический материал для повторения, характерный для технического языка. Разнообразие тематики дает возможность осуществления межпредметных связей, время изучения того или иного текста может быть согласовано с изучением соответствующего раздела из курса специальных дисциплин.

Пособие составлено по тематическому принципу и включает следующие основные разделы:

Измерительные приборы. Типы линейных измерений.

Тексты составлены на базе современных аутентичных источников с определенной адаптацией к уровню языковой подготовки обучающихся. Тексты снабжены тематическим словарем (Глоссарий) и элементарными упражнениями преимущественно лексического характера, способствующие развитию навыков устного высказывания. Упражнения в основном унифицированы и представляют собой задания к каждому из предлагаемых текстов раздела. Каждый раздел содержит текст для самостоятельной работы с определенным заданием к нему, целью которого является развитие навыков чтения, работы со словарем, реферирования и устного высказывания по заданной тематике. **В пособие включены элементы использования информационных технологий, изучение учебного материала с помощью quarkod.** Данное пособие предназначено для обучающихся с базовой начальной подготовкой по английскому языку, что предполагает знание фонетической системы, основных грамматических категорий, владение определенным объемом лексических единиц и речевых моделей.

В результате освоения методического пособия обучающийся должен уметь:

- общаться устно и письменно на иностранном языке на профессиональные темы
- переводить (со словарем) иностранные тексты профессиональной направленности
- самостоятельно совершенствовать устную и письменную речь
- пополнять словарный запас

PART 1

Active vocabulary. Translate the words.

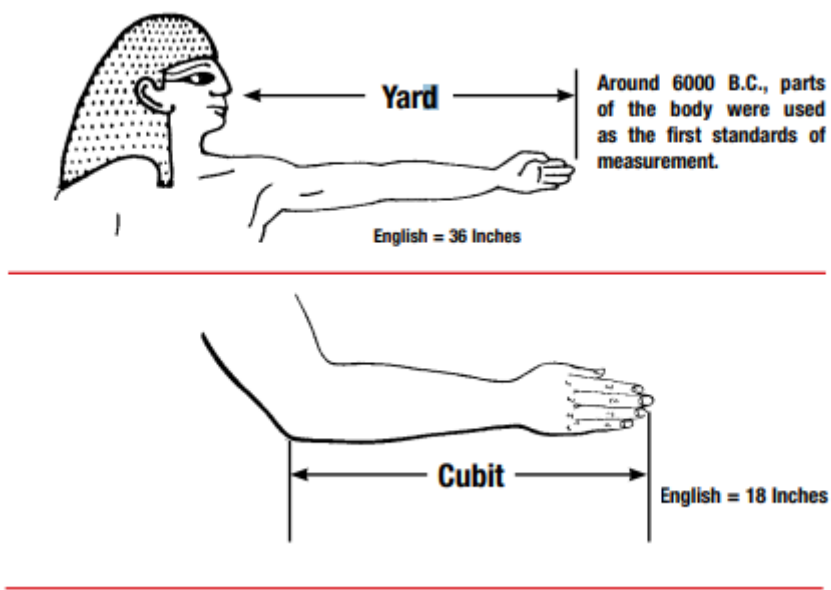
1. measuring tools	['mezərɪŋ tu:lz]
2. standards	['stændəds]
3. inch	[ɪnʃ]
4. hand	[hænd]
5. span	[spæn]
6. foot	[fʊt]
7. cubit	['kju:bɪt]
8. yard	[jɑ:d]
9. fathom	['fæðəm]
10. interchangeable	[ɪntə 'tʃeɪndʒəbl]
11. develop	[dɪ 'veləp]
12. spring tempered	[sprɪŋ 'tempəd]
13. invent	[ɪnvente]
14. calipers	['kælɪpəz]
15. the micrometer	[ði: maɪ 'krɒmɪtə]

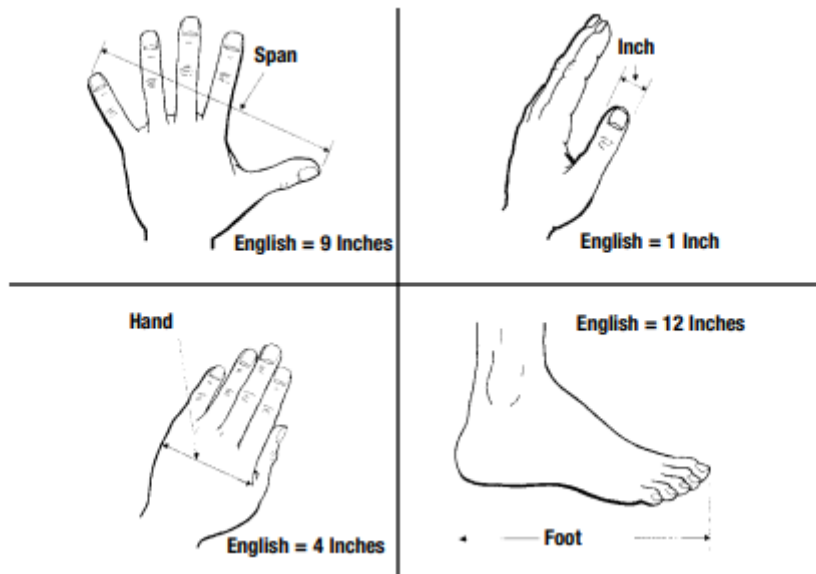
Read and translate the text into Russian

Earliest Measuring Tools.

Precision has not always been associated with measurement.

At the dawn of civilization, man began to use parts of the body to estimate dimensions and around 6000 B.C., from such measurements, there evolved the first standards of measurement: the inch, hand, foot span, cubit, yard and fathom. The tools of the past did not demand great accuracy. Most products were custom made by hand and a fraction of an inch one way or the other made little difference to satisfactory operation.





It was Eli Whitney who first conceived the basic idea of mass production through interchangeable parts. It was only through improved methods of measurement and mechanically powered machines that would mass production become possible. In 1800 he successfully applied his theories to the manufacture of muskets for the U.S. Government and is remembered today as the father of mass production through duplicate parts. Beginning with Eli Whitney's concept, the 19th century saw a tremendous growth in mass production of all types of goods.

Another factor was the greater use of mechanically powered machine tools instead of hand tools, along with better measuring devices. Machines and measuring tools approaching the accuracy of modern standards were not developed until after the Civil War. In 1848 in China Maine, a boy of twelve developed an interest in tools which led him in later years to establish a great company which earned the title, "World's Greatest Toolmakers." That boy's name was Laroy Starrett. His love of tools and a flair for invention sparked a long career that brought Eli Whitney's concept of mass production to precision tools. Laroy Starrett had "invention on the brain" and as a young man on the farm he spent much of his time in winter and on stormy days working with tools and developing ideas. His first invention was a meat chopping machine which he began to manufacture and sell throughout the country. In 1868 he moved to Athol MA, and resumed operations in a small shop.

Modern Measuring Tools



Laroy Starrett's main interest however, was in the development of precision measuring tools. The Combination Square was the first in a long line of tools he invented. From 1877 throughout the rest of his life, he devoted all of his energy and Yankee ingenuity to creating new and improved tools. Among these were spring tempered and flexible steel rules, steel tapes, calipers and dividers, the micrometer caliper, Vernier calipers, height gages and many other tools and metal cutting saw blades. This was Laroy Starrett's contribution to the present modern science of precision measuring and to the growth of industry as we know it today. Nearly all measurements common in shop practice involve measurements of length. Linear measurements are so numerous and of such importance that a multitude of measuring tools are available for the purpose of obtaining them.

Exercises:

1. Arrange the measurements from large to small
Inch, foot span, yard, fathom, hand, cubit
2. Use QR code and watch the video. Write down new names of measurements.



Try to find all measurements using your body. Fix the results.

3. Make a thesis plan of the text.

PART 2

Active vocabulary. Translate the words.

1. surfaces	[surfaces]
2. precision measurements	[pri'sɪʒən measurements]
3. thousandths	[thousandths]
4. dimension	[di'menʃn]
5. dial indicator	['daɪəl 'ɪndɪkətə]
6 straight edges	[streɪt 'edʒɪz]
7. a dial snap gage	[[ɑ 'daɪəl snæp geɪdʒ]
8. the contact points	[ði: 'kɒntækt 'pɔɪnts]
9. a millimeter	[ɑ 'mɪlɪmi:tər]
10. (to) use	[(tu:) use]
11. a separate	[[ɑ separate]
12. test indicator	[test 'ɪndɪkətə]
13. (to) divide	[[tu:) dɪ'vaɪd]
14. angularity	[æŋgjʊ'lærɪtɪ]
15. squareness	['skweənəs]

Read and translate the text into Russian

Linear Measurements



Linear Measurements on flat surfaces are perhaps the most common measurements. Linear measurements can be divided into three categories: 1. Coarse measurements with tools that are accurate between 1/64 inch (.0156mm) and a hundredth of an inch (.010mm). 2. Precision measurements are accurate to thousandths (.001) or ten thousandths (.0001) of an inch and, with proper tools, to millionths (.000001) of an inch. 3. In the metric system, accuracies to hundredths (.01mm)

or thousandths (.001mm) of a millimeter and, with proper tools, of 30 millionths (.00003mm) of a millimeter are possible.

The tool used varies with the size of the dimension, the nature of the work and the degree of accuracy required. It may range from a steel tape, rule, divider or trammel, to a micrometer, Vernier caliper, dial indicator or electronic gage. The measurement may be made directly, as with a micrometer or Vernier caliper, or it may be made indirectly by comparison with a separate standard or gage blocks, using a surface gage, height gage or test indicator, depending on the level of accuracy required, to transfer the measurement. Many related tools such as straight edges, steel squares and protractors are used in conjunction with linear measuring tools to determine flatness, straightness, squareness and angularity.



Measuring round work, a crankshaft journal, with an outside micrometer.

For Round Work, measurements are usually made by contact, using tools with contact points or surfaces such as spring calipers, micrometers, Vernier calipers and dial gages. Contact measurements are made in two ways: 1. By

pre-setting the tool (a dial snap gage, for example) required dimension, using a micrometer, gage blocks or other standard, and then comparing the set dimensions with the actual size of the work. 2. The reverse of this method, setting the contact points to the surfaces of the work and directly reading the size from a micrometer, Vernier caliper or dial gage. The first method is often used where repeated tests must be made such as in machining a piece to a given size or when checking the same dimension on a number of parts.

Exercises:

1. What are three categories linear measurements can be divided?
2. True, false or not stated?
 - Linear Measurements on flat surfaces are perhaps the most common measurements.
 - The measurement may be made only directly (ex. micrometer).
 - Contact measurements are made in two ways.
3. Look at the words. Correct the mistakes.
 Measurement, micrometer, tramel, metrik system, streihtness

PART 3

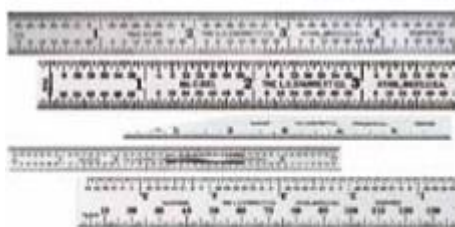
Active vocabulary. Translate the words.

1. rule	[ru:l]
2. key-ways	[ki:-weɪz]
3. can be graduated	[kæn bi: 'grædjʊeɪtɪd]
4. the National Institute of Standards and Technology (NIST).	[ðɪ: 'næʃnəl 'ɪnstɪtju:t ɒv] [stændəds ænd tek'nɒlədʒɪ]
5. measuring in grooves	[mezərɪŋ ɪn grooves]
6 Metric system	['metrɪk 'sɪstɪm]
7. the most convenient	

8. flexible	[ðɪ: məʊst kən'vi:nɪənt]
9. small holes	['fleksəbl]
10. narrow slots	[smɔ:l həʊlz] ['nærəʊ slɒts]

Read and translate the text into Russian

Steel Rulers and Related Tools



The steel rule is one of the basic measuring tools. Various types in English and metric are shown.

The ruler is a basic measuring tool from which many other tools have been developed. Rulers range in size from as small as one-quarter inch in length for measuring in grooves, recesses and key-ways to as much as twelve feet in length for large work. Steel rulers are graduated in the English (Inch) or Metric system and sometimes scales for both systems are provided on a single ruler. They can be graduated on each edge of both sides and even on the ends. English graduations are commonly as fine as one-hundredth (.010) inch in decimals or one sixty-fourth (1/64) inch in fractions. Metric graduations are usually as fine as one-half millimeter (0.50mm). Starrett rules are graduated to agree with standards calibrated by the National Institute of Standards and Technology (NIST). Steel Ruler Variations The 6-inch ruler is the most convenient length for carrying. A spring tempered ruler is desirable since it is both thin and flexible yet has ample stiffness to provide a straight measuring edge. Small rulers are available with a tapered end for measuring in small holes, narrow slots, from shoulders, etc. The Hook feature is available on many rulers. It provides an accurate stop for setting calipers, dividers, etc., and can also be used for taking measurements where it is not possible to be sure that the end of the rule is even with the edge of the work.

Exercises:

1. Use QR code and watch the video for extra information.



2. Use your ruler and meter the lines

3. What is NIST?

PART 4

Active vocabulary. Translate the words.

1. measuring tapes	['meʒərɪŋ ˈtæps]
2. the practical limits	[ðɪ: 'præktɪkəl 'lɪmɪts]
3. Standard for temperature	['stændəd fɔ: 'temp(ə)rətʃə]
4. Fahrenheit	['færənhaɪt]
5. available	[ə'veɪləbl]
6 graduations	[grəˈdʊeɪʃnz]
7. coefficient of expansion	[kəʊɪ'fɪʃnt ɒv ɪks'pænzən]
8. consecutive diameter	[kən'sekjʊtɪv daɪ'æmɪtə]
9. measuring circumference.	['meʒərɪŋ sə'kʌmfərəns]

Read and translate the text into Russian

Measuring Tapes



Measuring tapes are a logical extension of a graduated measuring tool beyond the practical limits of a steel rule.

Long line tapes are available in lengths up to 100 feet and are still accurate. Every Starrett tape is made to bench standards certified for accuracy by the United States Government – National Institute of Standards and Technology, Washington, D.C. Standard for temperature is 68 degrees Fahrenheit; coefficient of expansion is 0.00000645" per inch per degree F, or 0.00774" per degree per 100 feet; standard tension for steel tapes up to 100 feet long supported horizontally throughout is 10 pounds.

Like steel rulers, long-line tapes are available in a choice of graduations. Grey polymer coated or yellow baked enamel finish tape lines with quick-reading graduations, foot figures and 16-inch stud centers marked in red make reading easy and give long tape life. Steel tapes are also available with standard graduations on one side and special graduations in consecutive diameter graduations to 64ths or 100ths on the reverse. This allows for direct reading of diameter by measuring circumference.

Exercises:

1. Complete the sentences
 - Long line tapes are available in lengths up to and are still
 - Standard for temperature is; coefficient of expansion is per inch per degree F, or per degree per; standard tension for steel tapes up to long supported horizontally throughout is
2. Name the colors which are used to create the line and explain their functions.

3. What is used for direct reading of diameter?

PART 5

Active vocabulary. Translate the words.

1. micrometers	[micrometers]
2. the modern precision	[ðɪ: mɒdɪn prɪ'sɪʒən]
3. the screw	[ðɪ: skru:]
4. the sectional view	[ðɪ: 'sekʃnəl vju:]
5. the spindle revolve	[ðɪ: spɪndl rɪ'vɒlv]
6 the sleeve	[ðɪ: sli:v]
7. consecutively	[kən'sekjʊtɪvli]
8. the beveled edge	[ðɪ: beveled edʒ]
9. divisions.	[divisions]
10. marked	[mɑ:kt]

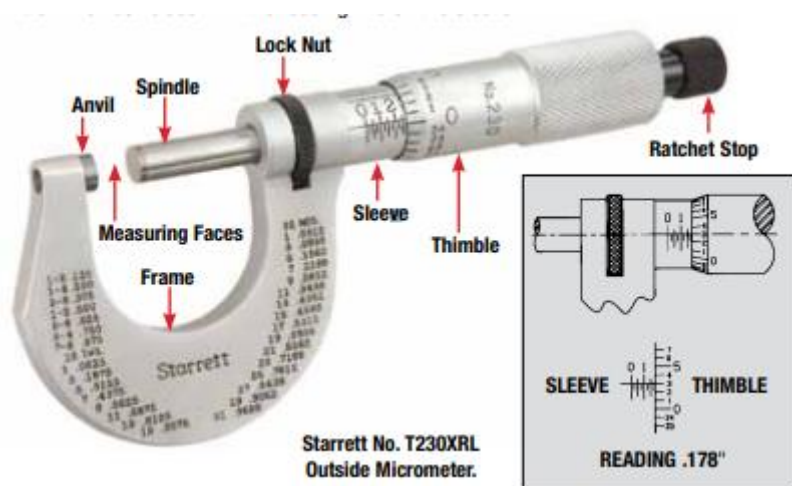
Read and translate the text into Russian

Micrometers



The first micrometers originating in France were rather crude. Laroy S. Starrett (1836-1922), founder of the L.S. Starrett Company, is responsible for the many improvements that make it the modern precision measuring tool that we know today. In effect, a micrometer combines the double contact of a slide caliper with a precision screw adjustment which may be read with great accuracy. It operates on the principle that a screw accurately made with a pitch of forty threads to the inch will advance one-fortieth (or .025) of an inch with each turn. In the metric system the pitch of the screw is 0.5mm. Each turn will advance the screw 0.5mm so it will take 50 turns to complete the normal range of 25mm. As the sectional view illustrates, the screw threads on the spindle revolve in a fixed nut concealed by a sleeve. On a micrometer caliper of one-inch capacity, the sleeve is marked longitudinally with 40 lines to the inch, corresponding with the number of threads on the spindle.

The reading line on the sleeve is divided into 40 equal parts by vertical lines that correspond to the number of threads on the spindle. Therefore, each vertical line designates $1/40$ or .025 of an inch and every fourth line, which is longer than the others, designates hundreds of thousandths. For example: the line marked "1" represents .100", the line marked "2" represents .200" and the line marked "3" represents .300", etc. The beveled edge of the thimble is divided into 25 equal parts with each line representing .001" and every line numbered consecutively. Rotating the thimble from one of these lines to the next moves the spindle longitudinally $1/25$ of .025" or .001 of an inch; rotating two divisions represents .002", etc. Twenty-five divisions indicate a complete revolution, .025 or $1/40$ of an inch. To read the micrometer in thousandths, multiply the number of vertical divisions visible on the sleeve by .025", and to this add the number of thousandths indicated by the line on the thimble which coincides with the reading line on the sleeve.



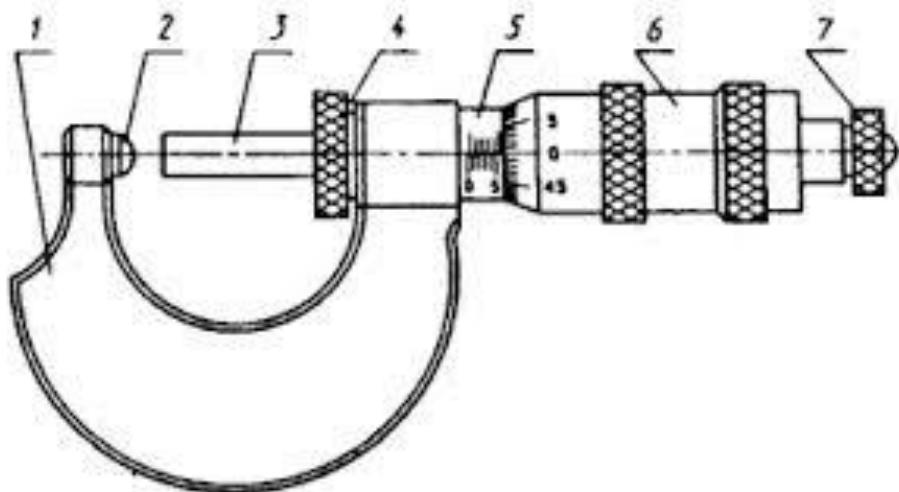
Example: refer to the illustration above: The “1” line on the sleeve is visible, representing. 0.100" There are 3 additional lines visible, each representing .025". $3 \times .025" = 0.075"$ Line “3” on the thimble coincides with the reading line on the sleeve, each line representing .001". $3 \times .001" = 0.003"$ The micrometer reading is. 0.178" An easy way to remember is to think of the various units as if you were making change from a ten dollar bill. Count the figures on the sleeve as dollars, the vertical lines on the sleeve as quarters and the divisions on the thimble as cents. Add up your change and put a decimal point instead of a dollar sign in front of the figures.

Exercises:

1. Use QR code and watch the video.



2. Fill in the plan of micrometer



3. Answer the questions:
 - Where was the first micrometer originated?
 - What does a micrometer combine?
 - What correspond to the number of threads on the spindle?

PART 6

Active vocabulary. Translate the words.

1. electronic tools	[ɪlek'trɒnɪk tu:lz]
2. to provide	[tu: prə'vaɪd]
3. error-prone	['erəprəʊn]
4. similar application	['sɪm(ə)lə æplɪ'keɪʃn]
5. available	[ə'veɪləbl]

Read and translate the text into Russian

Electronic Micrometers

Over the past couple of decades, microprocessing-based on electronic tools have become available. These have the advantage of being direct reading in either the English or metric, usually with a button that allows instant conversion between the two. They provide fast, easy to read displays that require no interpretation and therefore are less error-prone. They also have output ports allowing transmission of measurement data through the DataSure Wireless Data Collection System or older-technology cable-based systems for Statistical Process Control (SPC) and similar application where data must be recorded.



Electronic Micrometers combine these benefits with a resolution of fifty millionths of an inch. inch/millimeter conversion, plus the rugged construction, smooth operation, “feel” and balance of Starrett mechanical micrometers. The Starrett line of electronic micrometers includes outside, special function, internal micrometers and micrometer heads. The 795/796 Series are the latest generation electronic outside micrometers from

Starrett. They have a resolution of .00005" (0.001mm), an accuracy of ± 0.0001 " (± 0.002 mm) and a range from 0" to 1". The 795 Series includes output while the 796 micrometers do not. Both 795 and 796 Micrometers provide IP67 protection against shopfloor contaminants.

Exercises:

1. Watch the video



2. What is the advantage of microprocessing-based on electronic tools?
3. Why are microprocessing-based on electronic tools less error-prone?
4. What are 795/796 Series?

PART 7

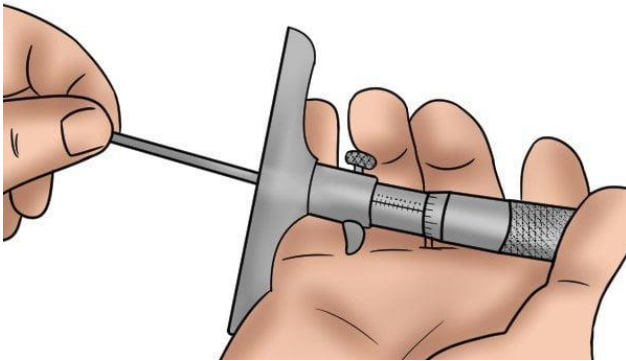
Active vocabulary. Translate the words.

1. to turn	[tu: tɜ:n]
2. the instructions	[ðɪ: ɪn'strʌkʃnz]
3. to the edge	[tu: ðɪ: edʒ]
4. clockwise	['klɒkwaɪz]
5. the sleeve scale	[ðɪ: sli:v skeɪl] [
6 the rotating	[ðɪ: rəʊ'teɪtɪŋ]
7. to use	[[tu: ju:s]

Read and translate the text into Russian

How to Use a Depth Micrometer

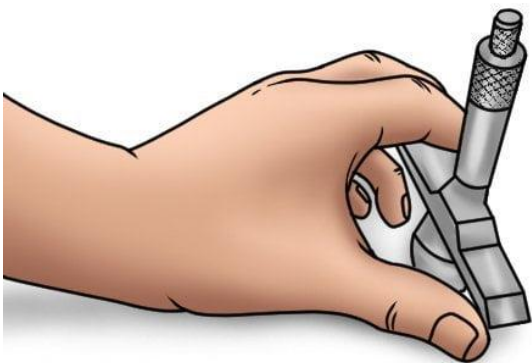
Step 1 :- Insert the spindle



Make sure the micrometer is zeroed first by inserting the 0-25mm (or 0-1") rod and following the instructions in the section on zeroing your micrometer.

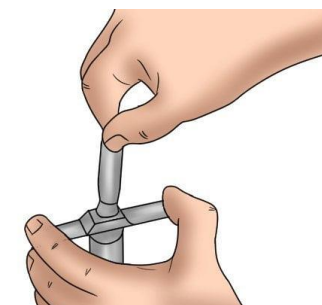
Using a rule or tape measure, estimate the distance to be measured. Using this estimate, choose the appropriate extension tube and insert it into the micrometer's bottom.

Step 2 :- Position



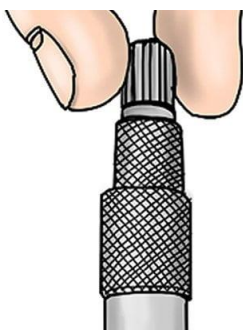
Insert the measuring rod as close to the edge (but not touching) as possible into the hole or onto the step being measured.

Step 3 :- Turn Thimble Step 2 Clockwise



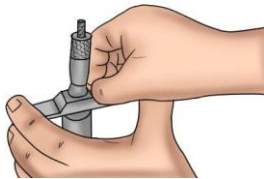
Turn the thimble slowly and clockwise, holding the base of the micrometer, until the tip of the rod is close to the bottom of the hole or step.

As you approach the surface to be measured, carefully turn the ratchet until the spindle stops rotating.

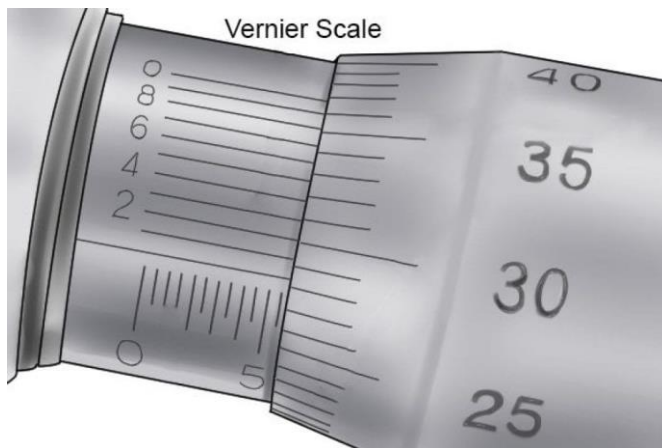


The ratchet will continue to turn, applying the proper amount of force for an accurate measurement. Using the micrometer thimble alone requires some skill and practice to get the right “feel.”

Step 4 :- LockSpindle



Step 5 :- Read The Measured Value, And Add This To The Length Of The Extension Rod Used.



Micrometer measurements are a **combination** of the value shown on the **sleeve scale** and the value indicated on the **rotating sleeve scale**.

When using a micrometer with an additional Vernier scale, the value on the Vernier scale may also be considered.

Exercises:

1. Watch the video



Literature-:

1. <https://www.machinistguides.com/category/measuring-tools/>
2. <https://reader.lanbook.com/book/298550#78>
3. <https://reader.lanbook.com/book/327383#80>
4. <https://reader.lanbook.com/book/331664#16>
5. Katsuhiko Ogata _ Modern Control Engineering 5th Edition.pdf
6. <https://e.lanbook.com/book/166556>