

PART 2. DRILLS CLASSIFICATION

1 Which of the following can you see in the pictures? There is one extra picture.

- A High helix drill
- A Spade drill
- A Low-helix drill
- A General - purpose drill
- A core drill
- A Centered drill
- A trepan



1.



2.



3.



4.



5.



6.



7.



8.

READING

2 Read the article and answer the questions 1-9. Write A-I.

Which drills are used:

- primarily to enlarge cored, drilled or punched holes?

0	D
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- for making precise holes regardless of hole depth?

1	
---	--
- to drill shallow holes in aluminum and magnesium alloys?

2	
---	--
- to make a conical indentation in the end of a workpiece?

3	
---	--
- for drilling deep holes in aluminum?

4	
---	--

- to cut large diameters and deep holes with less horsepower?

5	
---	--

- to cut different materials by changing the point angle

6	
---	--

- for deep holes drilling of medium to large diameter?

7	
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- in a wide range of sizes from very small microdrills to drills up to 300mm in diameter?

8	
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DRILL TYPES

A variety of drills are manufactured to suit different operations, workpiece materials, hole dimensions and special applications, such as surgery. The design of drills may vary in the number and width of the flutes, the amount of helix or rake angle of the flutes, or the shape of the land and margins. In addition, the flutes may be straight or helical, and the helix may be a right-hand or left-hand. Within the general classification of drills flat drills, twist drills and number of the special drills are discussed below.

A **Twist drill**

The most commonly used drill is the general-purpose twist drill, which has two helical flutes. This drill is designed to perform well on a wide variety of materials, equipment, and job conditions. The general-purpose drill can be made to suit different conditions and materials by varying the point angle.

B **Low-helix twist drill**

The *low-helix twist drill* was developed primarily to drill brass and thin materials. This modification of a twist drill is used to make shallow holes in some aluminum and magnesium alloys. Because of its design, the low helix drill can remove the large volume of chips formed by high rates of penetration when it is used on machines such as lathes.

C **High-helix twist drills**

High-helix twist drills are designed for drilling deep holes in aluminum, copper, die-cast material, and other metals where the chips have a tendency to jam in a hole. The high helix angle (35 to 45°) and the wider flutes of these drills assist in clearing chips from the hole, but weaken the drill body. It is used for cutting softer metals and other low strength materials.

D **Core drill**

A *coredrill*, designed with three or four flutes, is used primarily to enlarge cored, drilled, or punched holes. Due to greater number of teeth the core drill has advantages over the twist drills in productivity and finish. A core drill is named because its first use was in drilling out the hole left by a casting core, a cylinder placed in a mould for a casting that leaves an irregular hole in the product.

E Spade drills

Spade drills or flat drills are similar to gun drills in that the cutting end is a flat blade with two cutting lips. Spade drills are usually clamped in a holder and are easily replaced or resharpened. They are available in a wide range of sizes from very small microdrills to drills up to 300mm in diameter. Some of the smaller spade drills have replaceable carbide inserts.

F Gun drill

Gun drills belong to the pressurized coolant family of hole making tools. They are outstanding for fast, precision machining regardless of hole depth. As a rule, a gun drill can hold hole straightness within 0.8mm per 1m of penetration, even when the tool is reasonably dull. For most jobs a gun drill can cut from 12 to 25 meters in alloy steel before re-sharpening is necessary.

G Center drill

Center drills are used in metalworking to provide a starting hole for a larger-sized drill or to make a conical indentation in the end of a workpiece in which to mount a lathe center. In either use, the name seems apt, as the drill is either establishing the center of a hole or making a conical hole for a lathe center.

H Trepanning drill

A trepaning drill is a hollow drill that cuts a ring and leaves a center core. Trepanning drills usually have multiple carbide inserts and rely on cutting fluid to cool the cutting tips and to flush chips out of the hole. Because trepanning drills don't remove all the metal from a hole less horsepower is needed to make the hole.

I Ejector drill

An ejector drill is used for deep hole drilling of medium to large diameter holes (about 20mm up to about 100mm diameter). As a rule, the drill head is screwed to the body by means of a four-start square thread. The drill body is essentially a tube within a tube with cutting fluid traveling down between the tubes. Chip removal is back through the center of the drill.

3 *Read the article again and explain the underlined words. Can you find a Russian equivalent to any highlighted drill type?*

4 *Read the article again, choose three types of drills and make notes under the headings below. Then, use your notes to talk about it.*

- type ● description ● application

5 *Discuss the following questions in small groups.*

- How many types of drills do you know?
- What is the most commonly used?
- What advantage(s) has a core drill?
- What is the helix angle of a high helix drill?
- What is the size of holes which can be done by spade drill?
- What is the main peculiarity of an ejector drill?

VOCABULARY PRACTICE

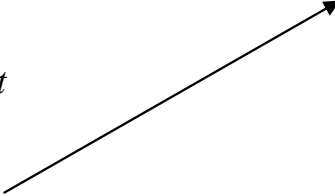
6 Fill in a correct word

- remove • travels • perform • flush • jam
- softens • double

1. The generally-purpose drill is designed to well on a great variety of materials, equipment, and job conditions.
2. The low helix drill can the large volume of chips formed by high rates of penetration.
3. In the high-helix drills, the chips have a tendency to in a hole.
4. A core drill bit may be used to the size of a hole.
5. The fluted, triangular point of hard-steel drill the metal by friction and then removes the softened metal ahead of it.
6. Trepan usually rely on water to cool the cutting tips and to chips out of the hole.
7. Cutting fluid down between the two tubes in an ejector drill.

7 Match the columns to form compound nouns, then use them to complete sentences 1- 8.

Chip	drill
Screw	material
Die-cast	form
Helix	removal
Core	lathe
Spade	machine
Chip	angle
Turret	drill



Some of the smaller spade drills have replaceable carbide inserts.

1. _____ differ from reamers in the amount of material they are intended to remove.
2. _____ classification during longitudinal turning of carbon steel with coated carbide inserts was performed by using cutting force sensor signals.
3. An edge-carrying drill body intended for deep hole drilling, is rotatable around a central geometric axis and comprises a through-channel arranged for internal _____.
4. The _____ is a form of metalworking lathe that is used for repetitive production of duplicate parts.

5. A _____ is a metalworking machine used in the high volume manufacture of turned components.
6. A _____ is sometimes called a flat drill.
7. The main _____ are: zinc, aluminium, magnesium, copper, lead, and tin.
8. Denoted in engineering textbooks as either ω (omega) the _____ plays a critical role in chip removal rate.

8 *Read the extract below and complete the table.*

The ZX 1000 electric drill has two speeds: the fast speed is 3,000rpm and the slower speed is 1,000 rpm. Adjust the speed according to the type of material and the size of the hole. For example, use the faster speed for a soft material such as wood to drill holes smaller than 10 millimeters (10MM) in diameter but choose the slower speed for the holes between 10 and 25 mm. However, for steel, a hard material, use the faster speed for holes smaller than 6.5 mm and choose the slower speed to drill holes between 6.5 and 10 mm.



fig. 1

Speed	Material	Diameter
1,000 rev/min		

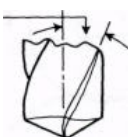
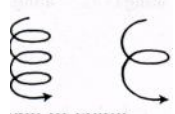
		10 mm – 25 mm
		< 6,5 mm

< = smaller than

> = greater than

9 Use the table and the words in the box to complete the text.

greatest	softest	quickest
smallest	hardest	slowest

	Helix angle 	A slow spiral a quick spiral  Type of spiral	Point angle 
For hard steel	5° to 10°	slow	130°
For mild steel	25°	standard	118°
For aluminium	40°	quick	90°

Hard steel is the hardest material in the

table. Drills for hard steel have the 1) _____ point angle and the 2) _____ helix angle. They have the 3) _____ spiral. Aluminium is the 4) _____ material in the table. Drills for aluminium have the 5) _____ helix angle and the 6) _____ point angle. They have the 7) _____ spiral.

GRAMMAR PRACTICE

The Infinitive

The Infinitive developed from the verbal noun, which in course of time became verbalized, retaining at the same time some of its nominal properties. Thus in Modern English the Infinitive, like the participle and the gerund, has a double nature, nominal and verbal. The formal characteristic of the Infinitive is the particle *to*, which is sometimes missed.

Meaning	Form	
Infinitive	Active Voice	Passive Voice
Infinitive Simple выражает действие, одновременное с действием сказуемого	to V to use	to be + Ved to be used
Infinitive Continuous выражает длительное	to be + Ving	-

действие, одновременное с действием сказуемого	to be using	
Infinitive Perfect выражает действие, предшествующее действию сказуемого	to have + Ved to have used	to have been +Ved to have been used
Infinitive Perfect Continuous выражает длительное действие, совершавшееся в течении отрезка времени, предшествовавшего действию сказуемого	to have been + Ving to have been using	-
Usage	Functions	
1. в позиции существительного N : А) перед глаголом; В) после глагола- связки; С) после глагола. 2. В позиции прилагательного Adj 3. в позиции наречия Adv	a) <i>To drill</i> is important. (подлежащее) b) His purpose is <i>to drill</i> correctly. (именная часть сказуемого) c) He began <i>to drill</i> several minutes ago. (часть глагольного сказуемого) He has an opportunity <i>to drill</i> on modern lathes. (определение) Mechanical engineer study <i>to drill</i> at the university. (обстоятельство)	

Find in the text sentences with the Infinitive and translate them into Russian.

10 Find the Infinitive construction in the sentences below, translate them as in the model.

Model 1: To obtain a steel of the desired quality is the main subject of the experiments carried out in the research laboratory of the plant. — Получение стали желаемого качества является основной целью опытов, проводимых экспериментальной лабораторией завода.

Model 2: To obtain a steel of the desired quality the research laboratory of the plant carried out a lot of experiments. — Для того чтобы получить сталь желаемого качества, экспериментальная лаборатория завода провела много опытов.

1. To develop a new method of cutting metals was necessary. To develop a new method of cutting metals the engineers made some interesting experiments. 2. To make good castings it is necessary to use large and properly placed risers to feed heavy sections. To make good castings is impossible without using large and properly placed risers to feed heavy sections. 3. To discover the stresses occurring requires careful figuring. To discover the stresses occurring, we require careful figuring. 4. To use an aluminium paint spray was the only really promising mold-treatment developed in the test work. To use an aluminium paint spray the engineers developed the only really promising mold-treatment during the test work. 5. To design new machine-tools is the task of a mechanical engineer. To design new machine-tools a mechanical engineer must study a lot. 6. To be an ideal engineer means to have knowledge, to improve one's ability to analyze, synthesize and develop insight into one's field. To be an ideal engineer one is to have knowledge, to improve one's ability to analyze, synthesize and develop insight into one's field.

11 Translate the following sentences with an infinitive construction.

Sometimes the Infinitive used as an attribute implies more or less prominent idea of purpose.

Example:

A casting **to be made** in a metal mold must be comparatively short. — Отливка, которая будет изготавливаться в металлической форме, должна быть сравнительно небольшой.

1. Engineers must know the best and most economical materials **to use**, understand the properties of these materials and how they can be worked. 2. Another factor for the industrial engineer **to consider** is whether each manufacturing process can be automated in whole or in part. 3. Industrial robots **to be built** now perform certain tasks even better than a human being. 4. There are few written instructions **to help** a melter in determining alloying additions **to be made** to a heat of steel melted in an induction furnace. 5. Heating temperatures, methods of quenching and shape of the part **to be treated** are the factors which particularly affect the amounts of distortion. 6. The tube **to be drawn** is mounted on the rollers on the turn-table bed-piece, and the left-hand end of the tube is brought in contact with the stripper plate incorporated in the head.

LISTENING

12 You are going to listen to Phil talking about cars of future. He talks about what they will be able to do and what concerns engineers will have. Listen to the dialogue. You will hear it twice. As you listen for the first time, answer questions 1-4. As you listen for the second time, answer questions 5-8.

For questions 1-4, choose the correct answer (A,B,C or D).

You have 30 seconds to read questions 1-4.



fig.1

the

1. What does Phil think will be the biggest change in cars?
 - A Fuel efficiency
 - B Alternative fuels
 - C Safety features
 - D Chapter models
1. What technology do they discuss?
 - A Driving without fuel
 - B Driving super fast
 - C Driving without people
 - D Driving invisible
2. Where will people always want to drive their cars?
 - A In the city
 - B In the country
 - C Both
 - D Neither
3. What does he see not happening for a long time?
 - A Underwater cars
 - B Flying cars
 - C Both
 - D Neither

For questions 5-7, choose the correct answer (A,B,C or D). You have 40 seconds to read questions 5-7.

4. What car engines cause a lot of damage to the planet?
 - A petrol
 - B electric
 - C hybrid
 - D diesel and petrol
6. Which auto company has cars that can drive without people?
 - A Chrysler
 - B Volkswagen
 - C Both
 - D Neither
7. What do people usually feel about driving a car?
 - A Amazement
 - B Freedom
 - C Both

D Neither

13 Gap filling

Fill the gaps in the sentences below with suggested words and word combinations. Listen again if necessary.

traffic and congenstion	ridiculously	thrill of driving
aerodynamics	fuel cells	alternative fuels

1. It's car design involved in cars in all aspects: the engine, the performance, the _____, so it's basically an overview of all kind of car aspects for the future.
2. In the near future I think the big developments will be _____.
3. They even use _____ such as hydrogen.
4. They could develop a system basically to help inner cities, because _____ is a problem
5. People always want their freedom in the country roads – the _____, the excitement.
6. The engineering is just _____ hi-tech, but I don't know about the flying cars.

14 Detailed Comprehension

Listen again and read these sentences, then decide which are true ☒ or false ☐.

1. Phil thinks that the development will be towards electric and hybrid cars.
2. There is no company at all which produce cars that can drive without people.
3. People always want to drive their own cars.
4. It's possible to manufacture flying cars in the near future.

PREPARING FOR PRESENTATION

15 Prepare to introduce the presentation of your own about drills and their classification.

Follow the instructions given below.



fig.1

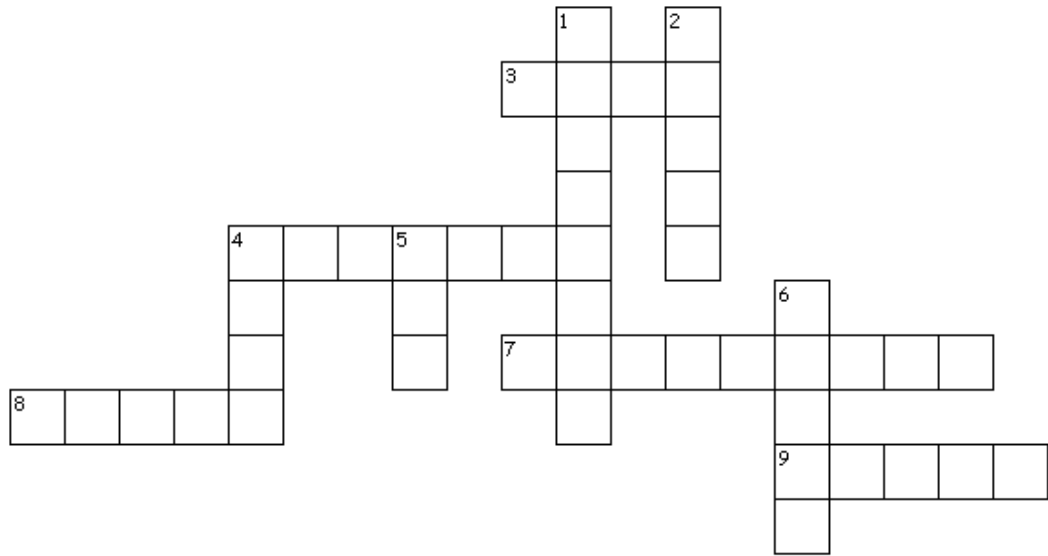
1	Introduction	Questions
2	Body	
3	Conclusion	
	Questions	

Function	Possible language
1. Welcoming your audience	• Good morning, ladies and gentlemen • Good afternoon, everybody
2. Introducing your subject	• I am going to talk today about ...

	• The purpose of my presentation is to introduce ...
3. Outlining your structure	• To start with I'll describe the progress made. Then I'll mention some of the problems we've encountered and how we overcame them. After that I'll consider the possibilities for further growth next year. Finally, I'll summarize my presentation (before concluding with some recommendations).
4. Summing up	• To conclude, • In conclusion, • Now, to sum up ... • So let me summarize/recap what I've said. • Finally, may I remind you some of the main points we've considered.
5. Giving recommendations	• In conclusion, my recommendations are ... • I therefore suggest/propose/recommend the following strategy.
6. Thanking your audience	• Many thanks for your attention. • Thank you for such an attentive audience, if you have any questions, I'll be happy to answer them.

REVISION TASK

DRILLS



Across

3. An area hollowed out in a solid body.
4. A fluid used to lubricate and cool the workpiece and cutting tool during machining.
7. Three or four fluted drill used to enlarge holes.
8. A mechanical device used to fasten, secure or fix one object to another.
9. Part of a tool by which it is held in a machine tool and rotated.

Down

1. A movement of an object in a circle.
2. A spiral shape or form.
4. Unwanted amount of material cut from a workpiece in form of small pieces
5. One of the cutting edges of a drill
6. A yellowish alloy of copper and zinc, sometimes including small amounts of other metals.