

**THE MINISTRY OF THE HIGHER AND AVERAGE VOCATIONAL  
EDUCATION OF REPUBLIC UZBEKISTAN**

**THE TASHKENT AUTO-ROAD INSTITUTE**

**THE CAR BUILDING FACULTY**

**Chair: «Technology of motor industry»**

**THEME: «Working out of a database for technological process of manufacturing  
of details**

**FINAL QUALIFYING WORK**

In a bachelor degree direction

5521100 “Land transport systems”

The chairman of the State certifying commission _____ Yusupov Z « ____ » _____ 2010 y	Managing chair . _____ Shermuxeimedov A A « ____ » _____ 2010 y
--	---

Has executed: the student of group 220-06

Valiyev J. F.

The head:

Shermuxeimedov A. A .

The adviser: \_\_\_\_\_

Has checked up: \_\_\_\_\_

The reviewer: \_\_\_\_\_

H the control: \_\_\_\_\_

TASHKENT - 2010

**THE MINISTRY OF THE HIGHER AND AVERAGE VOCATIONAL  
EDUCATION OF REPUBLIC UZBEKISTAN**

**THE TASHKENT AUTO-ROAD INSTITUTE  
THE CAR BUILDING FACULTY  
Chair: «Technology of motor industry»**

Managing chair . \_\_\_\_\_  
Shermuxeimedov A A « \_\_\_\_\_ »  
\_\_\_\_\_ 2010 y

**FINAL QUALIFYING WORK**

the student Valiyev J. F of group 220-06

**THEME: «Working out of a database for technological process of  
manufacturing of details.»**

Final Qualifying Work Theme Institute Chancellor N-172-1 “26” may  
2010y

2 Final work date . 25.06.2010

3 The did intil facts for exection FQW

**Database on machine tools ( NPC ) Internet materials \_\_\_\_\_  
methodical instructions Schemes a carving profile a cutter  
cutting at machining of details**

4 The purport calculation fication message of FQW

4.1 Classification of equipment machines with NPC

4.2 **Technical the characteristic turning machine tools with NPC**

4.3 Highly effective turning processing of details from

4.4 Schemes a carving profile a cutter

5 .The praphicschedule a material.

5.1 **The drawing turning machine tools with NPC**

5.2 **progrem a product of a database machine tools.**

6 Date of delivery tasc 15.01.2010

The head: Shermuxeimedov A. A

7 Labour safety and the safety precautio

7.1 **The Labour safety in the automated Manufactures NPC(without NPC)**

7.2 Norm under safety precautions industrial sanitary there are genera

### **7.3 Electric components enterprises**

The did graphic schedule FQW.

N	Final Qualifying Work Theme	term execution	The note
1	Introduction	20.02.2010	
2	Classification of equipment machines with NPC	20.03.2010	
3	Constructive features of the machine with NPC	20.04.2010	
4	The general information control systems of machine tools with NPC	1.05.2010	
5	Program structure of the databases of the machine with NPC	10.06.2010	
6	Highly effective turning processing of details from The cutting tool and piece preparations	15.06 2010	
7	Calculation and choice of a mode of cutting at machining of details	17 .06.2010	
8	Labour safety and the safety precautio	20.06.2010	
9	The conclusion	22.06.2010	
10	The literature list and references in the Internet materials	22.06.2010	

Has executed: the student of group 220-06

Valiyev J. F

The head:

Shermuxeimov A. A

## **INTRODUCTION**

In the reform country on formation steady but, economy give now positive articles. For short term considerable successes in work. Structural transformation to economy, maintenance of growth to strengthening of foreign trade and investment to reforming agro-economic sphere, stable spheres, small are reached, business and private business, activity bank-financial and in notable degree increase authority and camp positions on the international economic arena. Careful processing by the head of the state by Islam Karimov of strategy of economic development, exact and correct realisation of the purposes. And problems of economic reforms have created parcels for achievement of powerful results. state development. From the previous stages of progress. Russian cabbage soup the major aspect of it is strengthening of integration and national economies. These processes aggravate on international scene, affect on struggle of each state for strengthening of own positions the national a division of labour. It is necessary to notice, that with influence globalisations. Economic there are inconsistent moments. So non-uniform development of the separate states, strengthening, distinctions with developments of the various countries, ecological threats a difference of democratic growth in the separate states to stable development of the world economy as system. Still one feature of these processes - occurring-economic changes in one country influence and on other states. The financial-economic crisis which has captured now all world community in it with quality of a negative consequence of processes . In communications with definition of current and perspective actions for social and economic development of our republic, it is necessary to consider comprehensively influences of consequences of world financial and economic crisis, from the point of view of influence of these processes to make and realise programs of economic development. Actions of such plan widely also are in detail stated in work of President I.Karimov world financial and economic crisis. Ways and measures on it's overcoming in the conditions of Uzbekistan in work are in detail shined an essence world financial and economic crisis, the reason of occurrence and the form of its display, its influence on economy of Uzbekistan, prevention factors and crisis softening. The estimation positive results in economy 8 years that is reached by difficult and persistent work of workers is given, ways of wider use of economic potential of republic are specified. As a true way of overcoming of crisis and achievement of new heights in the world market priority directions are defined: Realisation of the anti-recessionary program of measures accepted in our country on prevention. Neutralisations of consequences world an economic crisis for 2009-2012, maintenance on this basis long-term rates and uniformity of growth of

economy;

2 continuation structural economy, carrying out of these processes modernisations, technical and technological reequipment, first of all, the major branches of economy directed on manufacture by the competitive production, corresponding international to standards qualities and best-selling on internal and external markets realisation of a wide complex urgent. The interconnected actions directed on radical. Quality and conditions of the rural life, the accelerated development social and industrial infrastructure the districts full. Revision of the status, role and value of patterns of ownership.

Business and a small-scale business, all-round support developments of farms;

1) Maintenance of employment of the population, active development of sphere of services. I and small-scale business as major factor of increase of a standard of living people;

2) The further development industrial and social infrastructures as the major factor of modernisation of the country of an occupation level of the population;

3) The further perfection of activity of banks, stimulation of attraction of free money resources of the population and managing subjects in deposits of commercial banks.

Full and effective realisation of the problems planned in the-president and uniform developed economy of Uzbekistan finding on this about a place of a standard of living and formations of Republic Uzbekistan of the President of Republic Uzbekistan of Islam Karimov special on work. World financial and economic crisis, ways and measures on the conditions of Uzbekistan with a view of its deep and all-round studying by the students full of comprehension specified in it a problem of knowledge of the major directions of the economic program calculated on 2009. The grant is prepared with a view of practical and the help to teachers and students at studying course in higher education system. Starting with the structural form of work of the President the manual it is divided on two sections. In the grant the logic is completely considered Sequence of the questions presented in work and problems. With a view of fuller explanation to students resulted in work the President about the put forward problems and ways of their decisions, in manual data of are widely used The main task here to define a situation with the businessman. That it is stirred also by what help from the state more necessary development of the business. Special attention it is necessary to give creation of a city of assistants concerning spirituality and enlightenment, cities and areas of full studying of a special course visual and interactive means are recommended prepared in 2009 popular scientific value and the basic concepts. Uzbek and Russian languages in the Uzbek language their visual versions. The specified materials and their electronic versions are applied. News reduction in demand and reduction of volumes of international trade and also serious

social losses which can concern many countries in the world. The second - the burst global financial crisis has shown serious blanks and necessity of cardinal reforming of operating world, financially-bank system, has confirmed absence of the due control over activity of banks which basically served the corporate interests, taking a great interest in various speculative operations in the credit market and a securities market. The third - scales, depth and consequences of financial and economic crisis in each separate state in many respects will depend, first of all, on durability of financially-currency system, capitalization and liquidity of national credit institutes, their dependence on foreign and corporate bank structures, and also the sizes gold - of currency reserves and ability to pay foreign credits, finally - from stability and competitiveness of a national economy. The fourth - the prompt exit from world financial crisis and its softening. Much depends on efficiency and a coordination of accepted measures within the limits of the separate states and the world community the priority is further development industrial and infrastructures as major factor modernisation of increase in employment of the population. There is a number of the reasons of giving of exclusive value to the given problem. In particular first, infrastructure development creates the necessary conditions for placing of the new enterprises and development as a whole are expanded with access to development of resources of the country rich minerals;

The developed system of an industrial infrastructure, everything, automobile and railways, effectively they serve as the major condition and the factor of decrease in production costs that raises competitiveness of production and as a whole our economy thirdly, development social maintenance with pure potable water, system of power supply, objects of social sphere finally are directed improvement of quality of a life of the population. Fourthly infrastructure development is extensive sphere of work. It allows to create new workplaces and population employment, especially youth to raise level and well-beings of people from this it is visible, that growth, the further development real economy sector in many respects from level of security of managing subjects factory an infrastructure. With a view of maintenance of advancing development of a modern-industrial and social infrastructure, creation on this basis of conditions for steady and dynamical development of economy the special program «Measures on the further development industrial and infrastructures for 2009» Is accepted and taken the control. As a result of the reference of special attention in republic in 2008 of sphere of rendering of services in principal views of the industrial system services to countrymen also! Does not answer!

To increasing modern requirements. In 2008 26,8 ~ % of volume of the rendered services it is necessary on agricultural population, the services rendered to each peasant it has appeared time to comparison with the services given besides, not at demanded level new kinds in particular, financial, others

which are necessary for climate creation in business of development of business develop. Despite tourist routes within republic are known. Despite established in the decision the President considerable privileges, in particular 3 years a tax payments of the tax to the income for paid sports services; Children's sports constructions and from the individual payment in the given type of service does not develop at all. On that in a fiscal year of 75 %. From again - constructed! The reconstructed childrens sports complexes, were are reduced. In communication with it in accepted by the government: By ours the decision about development of spheres of services and service are defined in you.

Indicators degree of growth of volumes of services. In 2009 it is planned 1389 new consumer services establishments. The basic it is frequent objects it will be created in a countryside; In the planned the organization annually more than 2009 thousand new is provided places. It is necessary to reconsider the territorial radically! Programs on development of sphere of services and to accept the additional to their accelerated development in a countryside as to the major. Employment of people, especially youth, and improvement of quality village. The main task here - to define a situation with the businessman what help from the state stirs also. Ford evelopment of the business. Special attention it is necessary to give creation. The conditions necessary for a private sector for expansion rendered services in a countryside the main task in the time consists in maintenance. The main task consists in maintenance of the further growth of well-being of people on the basis of steady, forward development of a national economy, acceleration of scientific and technical progress of transfer of economy on an intensive way of development, more rational use of potential of the country of the world economy of all kinds of resources and improvement of quality of work.

In the decision of this problem the essential place occupies acceleration of scientific and technical progress on the basis of manufacture modernisation, creation of high-efficiency mechs and the equipment of the big individual capacity, introduction of new and materials, progressive technology and systems of mechs for complex mechanization and manufacture automation. The leading place in the further growth of a national economy belongs to branches of mechanical engineering which provide a material basis of technical progress of all branches of a national economy. Use contactless measuring systems. Along with increase of accuracy of machine tools there is a process of their further automation on the basis of adjustable electric drives, electro automatics and computer facilities means. In connection with application of numerical programmed control at processing on the machine tool concentration degree on each separate machine tool has increased, and for the further

increase of their reliability began to equip with diagnostics tools and processing optimisation that is rather important for machine tools as a part of flexible industrial systems.

Now development of machine-tool constructing branch goes in a direction of increase of productivity of metal-cutting machine tools, their reliability and accuracy on the basis of application of the automated processes unified lahte of modules, the robotised technological complexes and computer facilities.

In given to the qualified work the database of machine tools with NPC collected on a basis references and the internet data for convenience of work with databases working out the program on the basis of a complex Sunrav BookEditor is created

## **1 Basing and bases in mechanical engineering**

Basing - giving to preparation or a product of demanded position concerning the chosen system of co-ordinates.

Base - a surface or a combination of surfaces, an axis, a point belonging to preparation or a product, and used for.

Basings for maintenance of an immovability of preparation or a product in the selected system of co-ordinates on them it is necessary to impose.

Six bilateral geometrical communications for which creation the complete set of bases is necessary. Technological base - used for definition of position of preparation or a product in the course of manufacturing or repair. Measuring base - used for definition of position of preparation or a product concerning means. Measurements preparation basing is understood as giving to it of certain position in the adaptation on purpose

Manufacturing of details with the set geometry. Having carried out basing, preparation fix, that at processing it. Kept an immovability concerning the adaptation. Basing and fastening - two different elements of installation.

They are carried out consistently, and basing is reached by imposing on preparation of the unilateral.

Communications, and basing together with fastening - bilateral, depriving mobility preparation in both parties on Considered axis .It is impossible to replace basing with fastening. On the preparation example for which basing in system of co-ordinates of the milling machine tool is carried out is the subsequent fastening.

Preparation basing in the adaptation is made by two or three bases. In group of bases The importance of each of them for the given operation among them the basis is allocated.

Established by this base in the adaptation, receives almost full orientation; For full orientation are used other, auxiliary bases.

The surfaces used as a basis flat, a cylindrical aperture, the cylindrical external surface.

The basis is chosen by the designer of the adaptation. For a basis it is preferable to take a surface, which provides to preparation steady position in the adaptation even at basing only one this base examples of bases are resulted on fig. For the preparation shown on as a basis The bottom surface is chosen. It is established on a basic plate. For cylindrical preparation as a basis the external cylindrical surface is chosen .It is established on a prism.

For the preparation shown on as a basis the cylindrical aperture is chosen. It is put on cylindrical.

Choice technological bases.

The algorithm of a choice of technological bases consists in the following. After input of a configuration of a detail it is carried out.

Automatic calculation of the areas of all surfaces of a detail and their ranging in decreasing order. As the basic bases the surface with the greatest area is offered to the user. If the user accepts the given variant.

Transition to a choice of auxiliary bases if it is not present is carried out - it is offered to the user following on the size the areas a surface. The choice of auxiliary bases is carried out similarly from the surfaces which have remained after a choice of a basis. Designing of a technological route.

The given problem - main and the most difficult. In a method of new planning use the various dialogue Subsystems of formation of a technological route. The initial information on a detail:

- The general data;
- Data on preparation (arrive from a subsystem of a choice of preparation);
- The description of external and internal surfaces;
- Maximum deviations.

The initial information is coded.

Subsystem database - sets of sequences of technological operations; values of parameters for calculation

Modes of cutting and processing time.

In a dialogue mode selection of technological operations, calculation and modes of cutting is carried out.

Calculation of expenses of time for detail manufacturing, calculation of any criterion of an optimality (for example, cost prices.

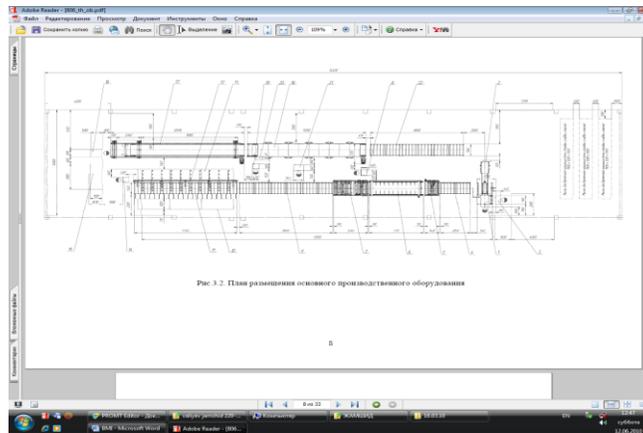
Detail manufacturing), optimization of a technological route by the chosen criterion.

Designing of technological operations.

Each technological operation chosen at a design stage of a technological route, is projected in

Kind of sequence of transitions. The same operation probably to various sequence

Differing transitions. The choice of the best variant is carried out by criteria: the operation cost price; Performance of operation and another. (Fig 1)



Capital equipment choice.

The equipment for performance of operations gets out depending on the planned structure of operations, dimensions and configurations of the detail demanded accuracy of processing, program of release of details.

Operation structure the list of the surfaces processed on operation depends on equipment possibilities, and On the contrary, the equipment gets out depending on operation structure, therefore these problems dare in parallel.

The database about machine tools contains the following information: an equipment code according to the qualifier;

Capacity of the machine tool; the maximum sizes of section of cutters which can be established in for the turning.

The machine tool); a maximum quantity of tools which can be established simultaneously on the machine tool; numbers of turns.

The equipment choice is usually optimized by criterion of cost.

Tool choice.

The choice of the cutting tool is carried out for each technological transition.

Initial data:

- Detail geometry;
- Data on preparation;
- Technical characteristics on the applied equipment.

The tool gets out of the help base covering all its versions.

Sequence of a choice of the tool the following:

- On a code of technological transition the code of group of the tool is defined;
- On machine tool model the code of a subgroup of the tool gets out;
- The sizes and other characteristics of the tool in the sizes and the form of deleted metal, cleanliness are specified.

Processings to a preparation material etc.

- The necessary tool in a database (on the generated sizes and other characteristics is searched.

Optimisation of designing of assembly processes.

Assembly works are multiple as on possible structure and sequence of operations and on structure of applied equipment, the equipment, the tool.

As criteria of optimisation are used:

- Labour input of process of assemblage;
- The technological cost price;
- A cycle assemblages (time);
- Expenses for assembly equipment.

Sequence of designing:

- A choice of the scheme of basing of assembly unit;
- A choice of optimum sequence of installation of elements of assembly unit;
- A choice of structure and sequence of performance of operations of connection, honing works;
- A choice of structure of equipment, the tool, the equipment;
- Calculation of technical and economic indicators;
- A choice of an optimum variant of technological process of assemblage;
- A documentation conclusion.

Automation of technological preparation of manufacture

At use of machine tools with NPC

Basic concepts

Technological preparation of manufacture for machine tools with NPC consists of three stages.

1 stage - working out of routeing technology.

2 stage - geometrical calculations and working out of the operating program.

3 stage - preparation of the machine tool for work and debugging of the ready program directly on the machine tool with NPC.

The first stage coincides with for usual manufacture; the second and third stages we will consider more in detail.

Geometrical calculations - the description of processed surfaces for the subsequent programming.

Geometrical calculations include removal of co-ordinates from the drawing and the task base and reference points.

Base point - such where the tool before the beginning and after processing end is deduced.

The reference point - in which is carried out change of a direction of movement of the tool.

On complexity degree geometrical calculations can be classified as follows.

Calculation of movings on a contour:

- The rectilinear flat;
- The curvilinear flat;

- The rectilinear volume;
  - The curvilinear volume;
- Calculation of movings
- The rectilinear flat;
  - The curvilinear flat;
  - The rectilinear volume;
  - The curvilinear volume.

Automation of machine tools with NPC.

Automated systems include the decision of the following problems which are absent in of the usual Manufactures:- Automation of geometrical calculations. calculations, especially difficult are carried out for Curvilinear surfaces and calculations of movings

- Programming automation. For simple problems - for example, for boring machines with NPC - It is entered.

The information on co-ordinates, diameters and depths of apertures then the program is formed automatically.

Challenges the program is formed in dialogue with the technologist. Further correctness parse is carried out Programs - the computer searches and specifies errors, the technologist - corrects. The following stage - program coding in Codes of the demanded machine tool and punched tape conclusion (or record on a magnetic tape or a flexible disk) - is carried out

Automatically; - Graphic modelling of a trajectory of movement of the tool for testing of programs NPC. The given problem

machine tools with NPC can be solved only with computer facilities use. Trajectory construction

Movements of the tool and its conclusion to the display or graph plotter screen allows to hold program testing.

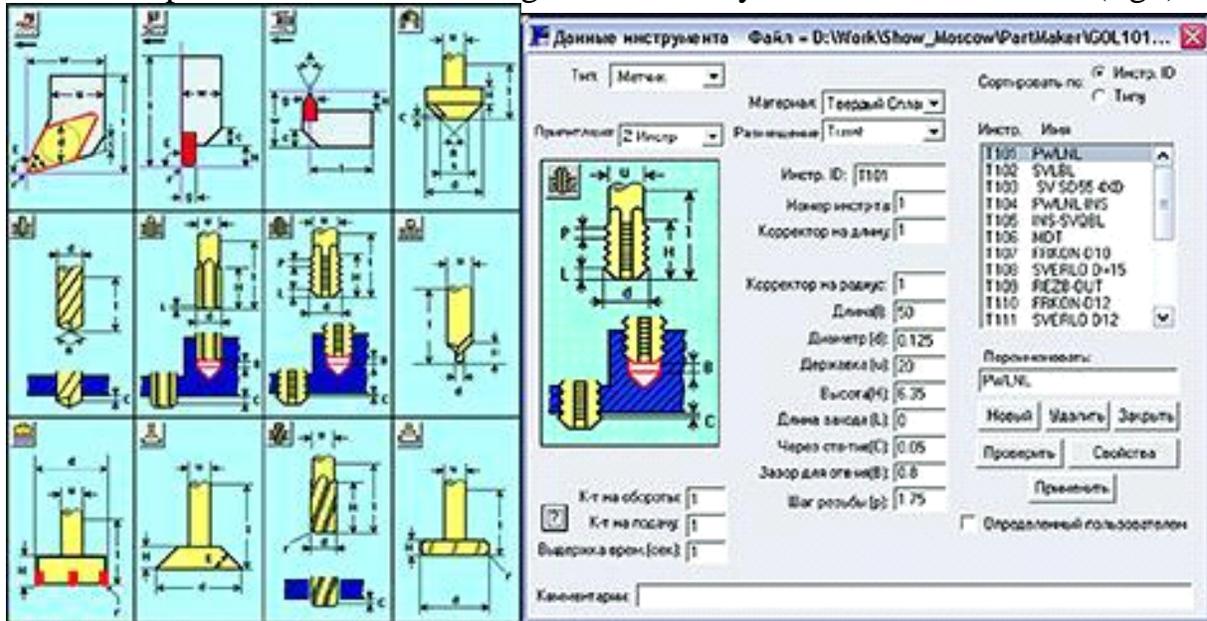
NPC at a stage of its working out and considerably to lower time for adjustment of the machine tool with . NPC

At the decision of problems of spatial processing, for the control of received programs NPC on the graph plotter. The graphic display for example, for definition of depth of drilling, mill movement etc., it is necessary to construct .To calculate values of sections in two or three projections. It demands a lot of time. Besides, at the problem decision. Simultaneous processing in several directions often happens it is impossible to restore unequivocally an image of a details.To drawings of its projections so, also it is impossible to check up correctness of program NPC.

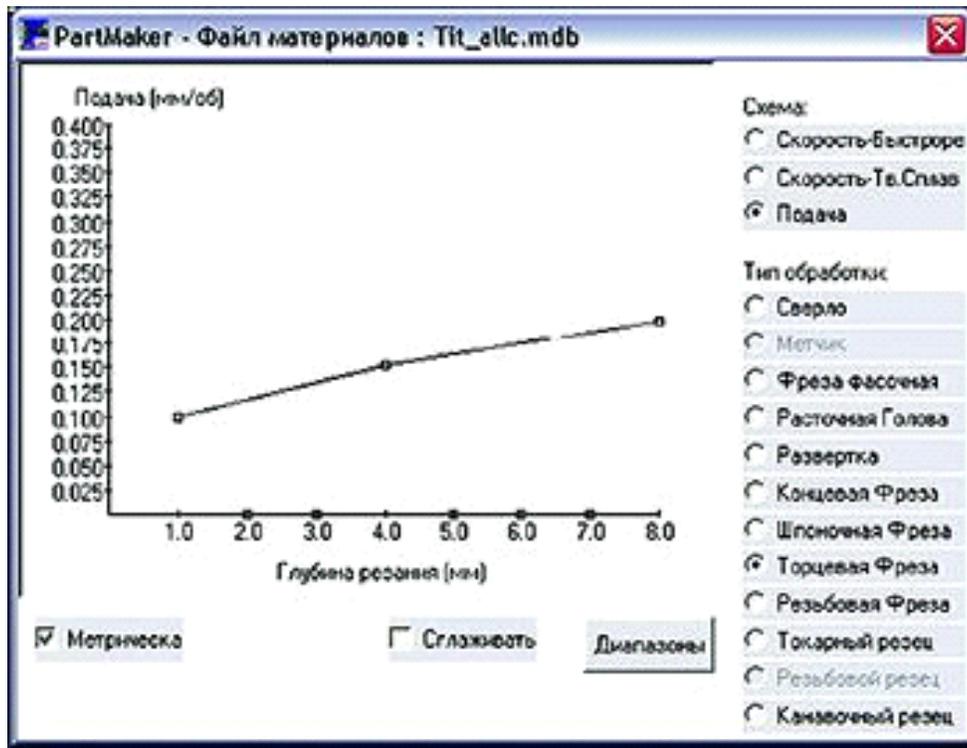
Databases of productions.

Effectively to use in work the saved up know-how in Part Maker databases about the cutting tool, cutting modes, machine tools with NPC and also operations of processing of apertures with use of the user cycles are used.

The database of tools unites the information on the most various cutting tools for turning and milling processing. She allows to keep data about geometry tools applied in concrete manufacture, to supervise their arrangement in capstans or in shops, in a tool spindle depending on detail processing in a spindle or automatically establishes optimum modes of cutting and necessary correction on the tool.(fig2)

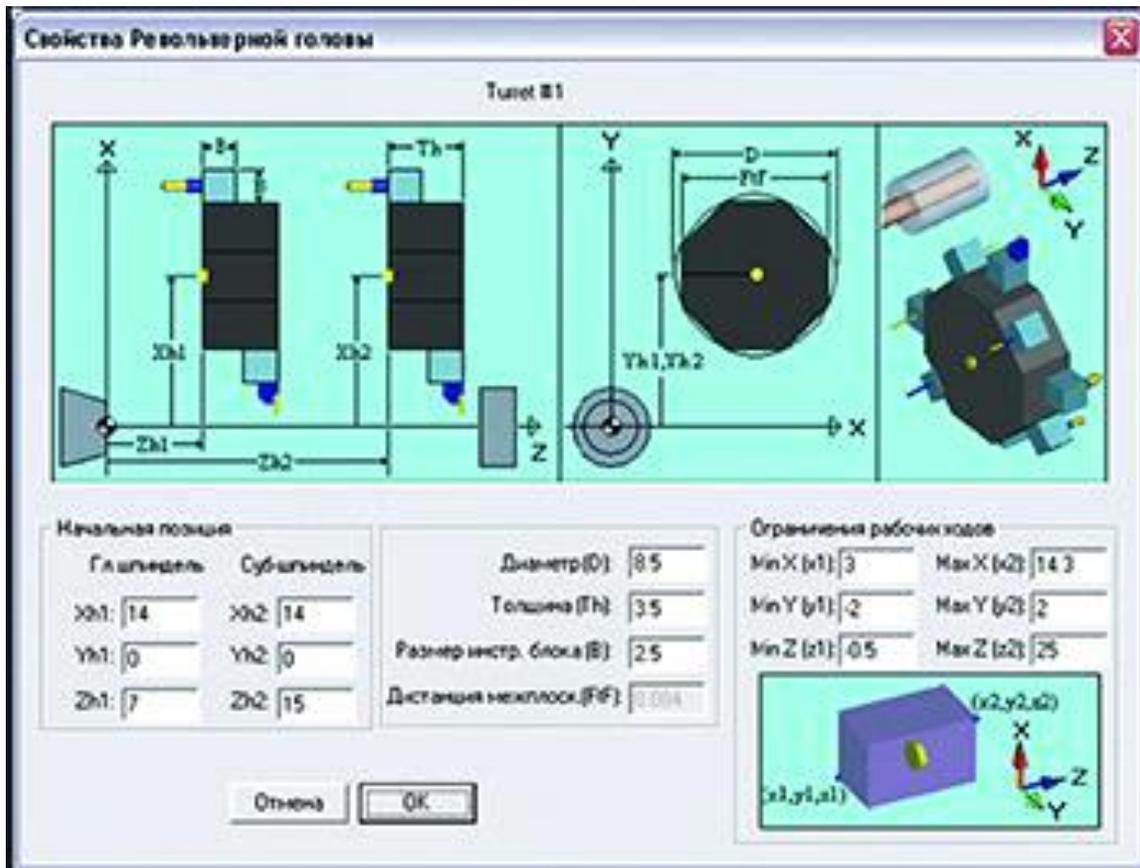


The database of materials allows to accumulate experience of processing of various materials, automatically to count optimum modes of cutting according to characteristics of the tool and requirements to cleanliness of a processed surface. Manual updating of modes, and also the task of correction factors for working givings and speeds of cutting is possible.(fig3)



The database of the user cycles contains the information on repeating operations of processing of apertures, among which drilling, expansion, carvings taps and thread-cutting mills. The database of cycles is directly connected with a database of tools. The user cycles can be kept and used for processing of other details. Depth of processing pays off automatically according to the set parameters of an aperture. There is a possibility of the visual control of a received aperture at a stage of programming of processing.

The database about machine tools NPC . Stores the information on the metalcutting equipment used in manufacture and allows to supervise correctness of programming of processing taking into account a design of each concrete machine tool: to consider the sizes of a working zone, presence tool shops, capstans, correctness of arrangement of tools on positions (fig4)



Working out of technological processes.

Distinguish three kinds individual, typical, group. Everyone is developed by manufacture preparation.

The products which designs are fulfilled on adaptability to manufacture.

Group technological process is intended for joint manufacturing of group of products various.

Configurations in concrete conditions of manufacture on specialised workplaces.

The group technological.Process is developed for the purpose of economically expedient application of methods and means business lot and mass.

Manufactures in the conditions of individual, small-scale and serial manufactures.

Typical technological process is characterised by unity of the maintenance and sequence of the majority.Technological operations for group of the products possessing the general constructive signs. Technological processes it is based on division of details and products into separate groups for which it is possible.

Working out of the general technological processes or operations.

it is developed for manufacturing of a new product or perfection let out.

As basis for new usually serves available typical or group If those are absent, forbasis take operating individual manufacturing of similar products. should

correspond to requirements of safety precautions and industrial sanitary on system of standards.

Safety of work, instructions and other standard documents. The initial information for working out subdivide on base, supervising and help. The base information includes the data containing in the design documentation on a product, and its program.

Release.

The supervising information contains:

- Requirements of branch standards to and to management methods them;
- Standards on the equipment and equipment;
- The documentation on operating individual, typical and group
- Qualifiers of the technical and economic information;
- Industrial instructions;
- Materials for choice technological specifications (modes of processing, norms of the expense of materials, etc.);
- The documentation on safety precautions and industrial sanitary.

The help information:

- The technological documentation of pilot production;
- Descriptions of progressive methods of manufacturing;
- Catalogues, passports, directories, albums of progressive means of technological equipment.

Initial data for designing of technological processes of assemblage:

- Product assembly drawings;
- The specification of details entering into knots;
- The size of a production target and term of its performance;
- Conditions of performance of assembly works.

Degree designing of technological process depends on release scale

Choice of a kind of preparation and its methods a choice technological bases

Consists in the following. After input of a configuration of a detail it is carried out Automatic calculation of the areas of all surfaces of a detail and their ranging in decreasing order. As the basic

Bases the surface with the greatest area is offered to the user. If the user accepts the given variant. Transition to a choice of auxiliary bases if is not present is carried out - it is offered to the user following on the size.

The areas a surface.

The choice of auxiliary bases is carried out similarly from the surfaces which have remained after a choice of a basis. Designing of a technological route. The given problem - main and the most difficult. In a method of new planning use the various dialogue. Subsystems of formation of a technological route.

The initial information on a detail:

- The general data;
- Data on preparation (arrive from a subsystem of a choice of preparation);
- The description of external and internal surfaces;
- Maximum deviations.

The initial information is coded. Subsystem database - sets of sequences of technological operations; values of parameters for calculation.

Modes of cutting and processing time.

In a dialogue mode selection of technological operations, calculation and optimisation of modes of cutting is carried out.

Calculation of expenses of time for detail manufacturing, calculation of any criterion of an optimality (for example, cost prices Detail manufacturing), optimisation of a technological route by the chosen criterion.

Designing of technological operations.

Each technological operation chosen at a design stage of a technological route, is projected in

Kind of sequence of transitions. The same operation probably to realise various sequence

Differing transitions. The choice of the best variant is carried out by criteria the operation cost price time. Performance of operation and another.

Capital equipment choice.

The equipment for performance of operations gets out depending on the planned structure of operations, dimensions and configurations of the detail demanded accuracy of processing, program of release of details.

Operation structure (i.e. the list of the surfaces processed on operation) depends on equipment possibilities. On the contrary, the equipment gets out depending on operation structure, therefore these problems dare in parallel.

The database about machine tools contains the following information: an equipment code according to the qualifier;

Capacity of the machine tool; the maximum sizes of section of cutters which can be established in резцедержателе for the turning.

The machine tool a maximum quantity of tools which can be established simultaneously on the machine tool; numbers of turns, etc.

The equipment choice is usually optimised by criterion of cost.

The choice of the cutting tool is carried out for each technological transition.

Initial data:

- Detail geometry;
- Data on preparation;
- Technical characteristics on the applied equipment.

The tool gets out of the help base covering all its versions.

Sequence of a choice of the tool the following:

- On a code of technological transition the code of group of the tool is defined;
- On machine tool model the code of a subgroup of the tool gets out;
- The sizes and other characteristics of the tool in the sizes and the form of deleted metal, cleanliness are specified.

Processings to a preparation material etc.

- The necessary tool in a database on the generated sizes and other characteristics is searched.

Optimisation of designing of assembly processes

Assembly works are multiple as on possible structure and sequence of operations and on structure of applied equipment, the equipment, the tool.

As criteria of optimisation are used:

- Labour input of process of assemblage;
- The technological cost price;
- A cycle assemblages (time);
- Expenses for assembly equipment.

Sequence of designing:

- A choice of the scheme of basing of assembly unit;
- A choice of optimum sequence of installation of elements of assembly unit;
- A choice of structure and sequence of performance of operations of connection, honing works;
- A choice of structure of equipment, the tool, the equipment;
- Calculation of technical and economic indicators;
- A choice of an optimum:

## **1.2 Classification of metal-cutting machine tools**

cutters Machine tools of the same type can differ configuration (for example, milling universal, vertical), kinematics, set of the links transferring movement, a design, a control system, the sizes, accuracy of processing.

Standards establish the basic sizes characterizing machine tools of each type. For turning and circular grinding machine tools it is the greatest diameter of processed preparation, for milling machine tools - length and width of a table on which preparations or adaptations are established, for cross-section -planing machine tools - the greatest course with a cutter.

The group of the same machine tools having similar configuration, kinematics and design, but the different basic sizes, makes a dimensional number. So, under the standard, for general purpose machine tools 12 standard sizes with diameter of an established product from 80 mm to 12,5 m are provided.

The design of the machine tool of each standard size, designed for the set conditions of processing, is called as model. Each model the code number - consisting of several figures and letters is appropriated. The first figure means the machine tool group, the second - its type, the third figure or the third and fourth figures reflect the

basic size of the machine tool. For example, the model 16K20 means: a lathe-screw cutter with the greatest diameter of processed preparation 400 mm. The letter between the second and third figures means certain modernisation of the basic base model of the machine tool.

Classification of machine tools by universality degree. Distinguish following machine tools - universal which use for manufacturing of details of the wide nomenclature with the big difference in sizes. Such machine tools are adapted for various technological operations:

specialised which are intended for manufacturing of the same details, for example, case details, step shaft similar in the form, but various on the size;

Special which are intended for manufacturing of one certain detail or one form with a small difference in sizes.

Classification of machine tools by accuracy degree. Machine tools are divided into 5 classes: H - machine tools of normal accuracy, P - machine tools of the raised accuracy, In - machine tools of high accuracy, And machine tools of the raised accuracy, With - especially exact or master machine tools. The model designation can include the letter characterizing accuracy of the machine tool: 16K20P- a Lathe-screw cutter of the raised accuracy.

Classification of machine tools by automation degree. Allocate automatic machines and semiautomatic devices. The automatic machine all movements necessary for performance of an operation cycle, including loading of preparations and an unloading of ready details name the machine tool, in which ambassador of adjustment, is carried out automatically, carried out by mechanisms of the machine tool without participation of the operator.

The cycle of work of a semiautomatic device is carried out also automatically, except for loading-unloading which are made by the operator, it carries out start-up of a semiautomatic device after loading of each preparation.

For the purpose of complex automation for business lot both mass production create automatic transfer lines and the complexes uniting various automatic machines, and for small-scale manufacture - flexible industrial modules .

Automation of small-scale manufacture of details is reached by creation of machine tools with programmed control (cyclic), letter S is entered into a designation of models (or numerical the letter). The figure after letter A designates feature of a control system; F1 - the machine tool with digital indication (with display of the numbers reflecting, for example, position of mobile body of the machine tool) and a preliminary set of co-ordinates; F2 - the machine tool with item or rectangular system; F3 - the machine tool with planimetric system; F4 - the machine tool with universal system for item and planimetric processing, for example, model 1B732F3 - a lathe with planimetric system NPC

Classification of machine tools by weight. Machine tools subdivide into lathes - to 1 averages - to The device and classification

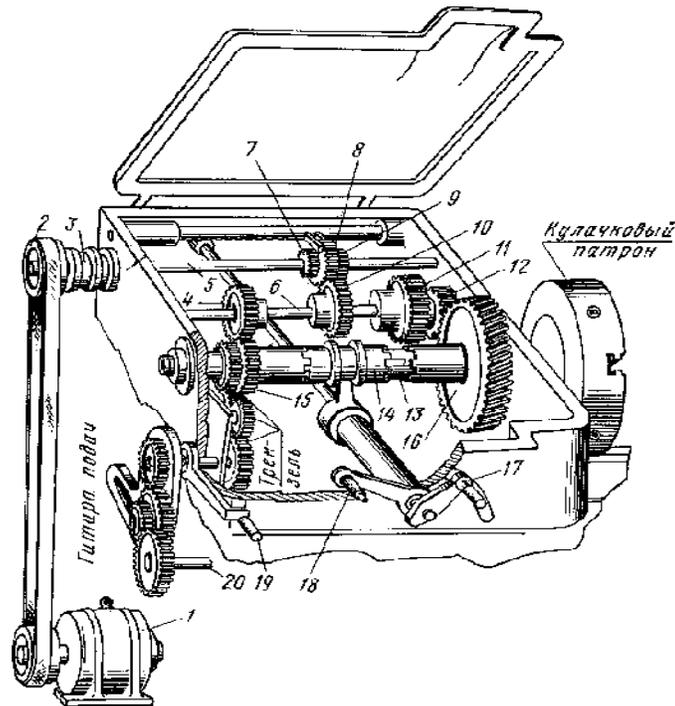
Lathe-screw cutters are intended for processing, including carvings, individual details and small groups of details. However there are machine tools without the running screw. On such machine tools it is possible to carry out all kinds of turning works, except carvings a cutter. In technical parameters on which classify screw cutters, are the greatest diameter  $D$  processed preparation (detail) or height of the Centers over a bed (equal  $0,5 D$ ), the greatest length  $L$  processed preparation (detail) and weight of the machine tool. A number of the greatest diameters of processing for screw cutters looks like:  $D = 100, 125, 160, 200, 250, 320, 400, 500, 630, 800, 1000, 1250, 1600, 2000$  and further to  $4000$  mm. The greatest length  $L$  a processed detail is defined by distance centre to centre the machine tool.

Assembly units (knots) and Lathe-screw cutter mechanisms: 1 - the forward grandma, 2 - a support, 3 - the back grandma, 4 - a bed, 5 and 9 - curbstones, 6 - an apron, 7 - the running screw, 8 - the running platen, 10 - a box of givings, 11 - guitars of replaceable gear wheels, 12-starting equipment, 13 - a box of speeds, 14 - a spindle.

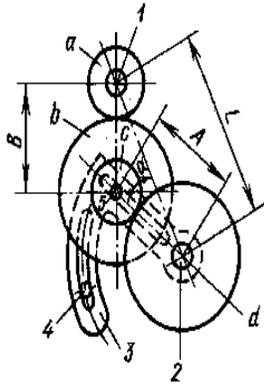
Let out machine tools at same value  $D$  can have various values  $L$ . On weight lathes share on lathes - to  $500$  kg ( $D = 100 - 200$  mm), averages - to  $4$  T ( $D = 250 - 500$  mm), large - to  $15$  ( $D = 630 - 1250$  mm) and heavy - to  $400$  T ( $D = 1600 - 4000$  mm). Easy lathes are applied in tool manufacture, instrument making, the hour industry, in experimental and development shops of the enterprises. These machine tools are issued both with mechanical giving, and without it. On average machine tools it is made  $70 - 80$  % of total amount of turning works. These machine tools are intended for fair and semifair processing, and also for carvings of different types and are characterised by high rigidity, sufficient capacity and a wide range of frequencies of rotation of a spindle and tool givings that allows to process details on economic modes with application of modern progressive tools from firm alloys and superfirm materials. Average machine tools are equipped with the various adaptations expanding their technological possibilities, facilitating work of the worker and allowing to raise quality of processing, and have high enough level of automation. Large and heavy lathes are applied basically in heavy and power mechanical engineering, and also in other branches to processing rolling mills, railway wheel pairs, rotors of turbines, etc. All assembly units (knots) and mechanisms of Lathe-screw cutters have the identical name, appointment and an arrangement. Look drawing above. The typical screw cutter 16K20 factory "Red proletarian" is shown in drawing below.

The main drive of the machine tool. In the forward grandma boxes of speeds and a spindle which result in rotation a processed detail at chosen to depth of cutting and giving are placed. In drawing the device of a box of speeds which works as follows

is shown. Preparation is clamped in a cartridge which fastens to a flange of a spindle 13. Rotation from the electric motor 1 through a belt drive 2 inclusions 3 is transferred to a shaft 5.(fig5)



The block from three gear wheels 7, 8 and 9, located on a shaft 5, with the help transfers is connected with the handle 17. The block of gear wheels is entered by this handle into gearing with a cogwheel 4 (either 10, or 11), rigidly fixed on a shaft 6. Wheels 4 and 12 are interfaced according to wheels 15 and 16 which transfer twisting moment to a spindle through gear 14, connected to the handle 18. If is moved to the right the spindle receives rotation through a cogwheel 16 and if to the left - through a cogwheel 15. This the box of speeds provides six steps of frequency of rotation of a spindle. The mechanism of givings. Communication of a spindle and a support of the machine tool for maintenance of an optimum mode of cutting is carried out by means of the mechanism of givings consisting from of the device (and guitar which carry out change of a direction and speed of moving of a support. (fig6)



The drive of this mechanism is carried out from a box of speeds through (look drawing on the right), which consists of four cogwheels and, in connected with the handle 19, by which switching the backspacing is carried out ( Change of a direction of rotation) a shaft 20 (a support power shaft). Positions and, in, S 19 and 20 (drawings see). At extreme bottom position of the handle 19 (position) cogwheels and, in, are connected consistently and the direction of rotation of a shaft 20 coincides with a direction of rotation of a spindle. At the top position of the handle 19 (position) cogwheels and are connected only, in, r and the direction of rotation of a shaft 20 changes on the opposite. On the average position of the handle 19 (position) cogwheels and in do not incorporate to a cogwheel and the shaft 20 does not rotate

By means of a guitar (erase drawing at the left) establish (adjust) cogwheels with the certain transfer relation providing necessary moving of a support on one turn of a spindle. Distance L between shaft 1 and 2 is to constants. On a shaft 2 it is freely established 3 guitars, fixed by a bolt 4. An axis of 5 intermediate wheels hung it is possible to move on a radial groove, thereby changing distance And centre to centre wheels c and d. The arc groove 3 allows to regulate the size of Century

Box of givings . Appointment of a box of givings - to change speeds of rotation of the running screw and a running shaft, than moving of a support with the chosen speed in longitudinal and cross-section directions is reached. The shaft 14 in bearings 15 (erase drawing) boxes of givings receives rotation from guitar cogwheels; together with it rotates and has possibility to move along it cogwheel II with the lever 10. On one end of the lever 10 rotates (on an axis) a cogwheel 12 interfaced to a cogwheel 11, and on other - the handle 9 with which help the lever 10 moves along a shaft 14 and can occupy any of ten positions (on number of cogwheels in 1 Norton's mechanism). The lever 10 turns and kept In each of such positions by a pin 9 which enters into corresponding apertures on a forward wall of 7 boxes of givings. Thus the cogwheel 12 enters into gearing with a corresponding cogwheel 13 mechanisms 1 therefore the chosen number of turns of a shaft 2 is established. Together with shaft 2 the cogwheel 3 which can be moved along it the handle rotates. At moving to the right the cogwheel means 4 incorporates to the

running screw 5 and transfers its rotary movement, and at moving to the left - enters into gearing with a cogwheel 8 and transfers rotary movement to a running shaft 6

## **2 Design features of machine tools with NPC**

Machine tools with NPC have the expanded technological possibilities at preservation of high reliability of work. The design of machine tools with should provide, as a rule, combination of various kinds of processing - milling, milling - grinding), convenience of loading of preparations, unloadings of details (that is especially important at use of industrial robots), automatic or remote control by tool change etc.

Increase of accuracy of processing is reached by high accuracy of manufacturing and the rigidity of the machine tool exceeding rigidity of the usual machine tool of

the same appointment for what make reduction of length of its kinematic chains apply independent drives, whenever possible reduce number of mechanical transfers. Drives of machine tools with NPC Should provide high speed also.

Accuracy increase is promoted also by elimination of backlashes in transfer mechanisms of drives of givings, decrease in losses on a friction in directing and other mechanisms, increase, decrease in thermal deformations, application in machine tools of gauges of a feedback. For reduction of thermal deformations it is necessary to provide a uniform temperature mode in machine tool mechanisms that promoted, for example, by a preliminary warming up of the machine tool and its hydrosystem.

The temperature error of the machine tool can be reduced also, entering correction in a drive of givings from signals of gauges of temperatures.

Base details (beds, columns, the bases) carry out more rigid at the expense of introduction of additional edges of rigidity. The raised rigidity mobile bearing elements (have also supports, tables, a sled). Tables, for example, design the box-shaped form with longitudinal and cross-section edges. Base details produce cast or welded. The tendency to carry out such details from polymeric concrete or a synthetic granite was outlined, that in even большей degrees are raised by rigidity and the machine tool.

Directing machine tools with NPC have high wear resistance and small force of a friction that allows to lower capacity of a watching drive, to increase accuracy of movings, to reduce a mismatch in watching system.

Directing slidings of a bed and support for reduction of factor of a friction create in a kind of pair sliding a steel (or high-quality pig-iron) - a plastic covering .

Directing качения have high durability, are characterised by a small friction, and the friction factor practically does not depend on speed of movement. As bodies use rollers. The preliminary tightness raises rigidity directing in 2... 3 times, for tightness creation use regulating devices.

Drives and converters for machine tools with at. In connection with development of microprocessor technics converters are applied to drives of giving and the main movement with full microprocessor management - digitizers or digital drives. Digital drives represent the electric motors working on constant or an alternating current. Structurally converters of frequency, servo-drivers and devices of the main start-up and a backspacing are electronic blocks of management.

Drive of giving for machine tools with. As a drive use the engines representing synchronous from digitizers synchronous or asynchronous engines for machine tools with NPC produce with a constant magnet on the basis of rare-earth elements and equip with gauges of a feedback and brakes. Asynchronous engines apply less often, than synchronous. The drive of movement of givings is characterised by its minimum possible backlashes, small time of dispersal and braking, small forces of

the friction, the reduced heating of elements of a drive, the big range of regulation. Maintenance of these characteristics probably thanks to application of the ball and hydrostatic screw gears directing качения and hydrostatic directing, reducers with short kinematic chains etc.

Drives of the main movement for machine tools with usually are alternating current engines - for the big capacities and a direct current - for low powers. As drives serve the three-phase two-port asynchronous engines perceiving the big overloads and working at presence in air of a metal dust, shavings, oils . Therefore in their design the external fan is provided. The engine build in various gauges, for example the gauge of position of a spindle that is necessary for orientation or maintenance of independent co-ordinate.

Converters of frequency for management of asynchronous engines have a range of regulation to 250. Converters represent the electronic devices constructed on the basis of microprocessor technics. Programming and their works are carried out from built in with the digital or graphic display. Management optimization is reached automatically after introduction of parametres the electric motor. In a software possibility of adjustment of a drive and its start-up in operation is put in pawn.

Spindles of machine tools with NPC carry out exact, rigid, with the raised wear resistance of necks, landing and basing surfaces. The spindle design considerably becomes complicated because of the devices built in it automatic and a clip of the tool, gauges at adaptive management and automatic diagnostics.

Support of spindles should provide accuracy of a spindle for a long time in the variable working conditions, the raised rigidity, small temperature deformations. Accuracy of rotation of a spindle is provided first of all with high accuracy of manufacturing of bearings.

Most often in support of spindles apply bearings For reduction influence of backlashes and increase of rigidity of support usually establish bearings with a preliminary tightness or increase number of bodies . Sliding bearings in support of spindles apply less often and only in the presence of devices with periodic (manual) or backlash automatic control in an axial or radial direction. In precision machine tools apply aerostatic bearings in which between a neck of a shaft and a bearing surface there is compressed air, thanks to it deterioration and bearing heating decreases, accuracy of rotation, raises.

The positioning drive ( movings of working body of the machine tool to a demanded position according to the program) should have high rigidity and provide smoothness of moving at small speeds, the big speed of auxiliary movings of working bodies (to 10 m/mines and more).

Auxiliary mechanisms of machine tools with NPC include devices of change of the tool, shaving cleaning, greasing system, tightening adaptations, loading devices etc. This group of mechanisms in machine tools with NPC considerably differs from

the similar mechanisms used in usual universal machine tools. For example, as a result of increase of productivity of machine tools with NPC there was a sharp increase in quantity of a descending shaving in unit of time, and from here there was a necessity of creation of special devices for shaving tap. To reduction of losses of time at loading apply the adaptations allowing simultaneously to establish preparation and to remove a detail during processing of other preparation.

Devices of automatic change of the tool (shops , autooperators, capstans) should provide the minimum expenses of time for tool change, high safety in operation, stability of position of the tool, a constancy of the size of a start and axis position at repeated changes of the tool to have necessary capacity of shop or a capstan.

The capstan is the most simple device of change of the tool: installation and a tool clip carry out manually. In a working position one of spindles is resulted in rotation from the main drive of the machine tool. Capstans establish on turning, drilling, milling, multi-purpose machine tools with; in a head fix from 4 to 12 tools NPC

Increase of accuracy of processing is reached by high accuracy of manufacturing and the rigidity of the machine tool exceeding rigidity of the usual machine tool of the same appointment for what make reduction of length of its kinematic chains: apply independent drives, whenever possible reduce number of mechanical transfers. Drives of machine tools with NPC should provide high speed also.

Accuracy increase is promoted also by elimination of backlashes in transfer mechanisms of drives of givings, decrease in losses on a friction in directing and other mechanisms, increase decrease in thermal deformations, application in machine tools of gauges of a feedback. For reduction of thermal deformations it is necessary to provide a uniform temperature mode in machine tool mechanisms that promoted, for example, by a preliminary warming up of the machine tool and its hydrosystem. The temperature error of the machine tool can be reduced also, entering correction in a drive of givings from signals of gauges of temperatures.

Base details (beds, columns, a sled). Tables, for example, design the box-shaped form with longitudinal and cross-section edges. Base details make cast or welded. The tendency to carry out such details from polymeric concrete or a synthetic granite was outlined, that in even degrees are raised by rigidity and the machine tool.

Directing machine tools with NPC have high wear resistance and small force of a friction that allows to lower capacity of a watching drive, to increase accuracy of movings, to reduce a mismatch in watching system.

Directing slidings of a bed and support for reduction of factor of a friction create in a kind of pair sliding "a steel (or high-quality pig-iron) - a plastic covering .

Drives and converters for machine tools with. NPC In connection with development of microprocessor technics apply converters to drives of giving and the main movement with full microprocessor management - digital drives represent the

electric motors working on constant or an alternating current. Structurally converters of frequency, servo-drivers and devices of the main start-up and a backspacing are separate electronic blocks of management.

Drive of giving for machine tools with NPC As a drive use the engines representing synchronous from digitizers synchronous or asynchronous machines synchronous engines for machine tools with NPC make with a constant magnet on the basis of rare-earth elements and equip with gauges of a feedback and brakes. Asynchronous engines apply less often, than synchronous. The drive of movement of givings is characterised by is minimum possible backlashes, small time of dispersal and braking, small forces of the friction, the reduced heating of elements of a drive, the big range of regulation. Maintenance of these characteristics probably thanks to application of the ball and hydrostatic screw gears directing and hydrostatic directing, of reducers with short kinematic chains.

Drives of the main movement for machine tools with NPC Usually are alternating current engines - for the big capacities and a direct current - for low powers. As drives serve the three-phase four-strip asynchronous engines perceiving the big overloads and working at presence in air of a metal dust, shavings, oils . Therefore in their design the external fan is provided. The engine build in various gauges, for example the gauge of position of a spindle that is necessary for orientation or maintenance of independent co-ordinate.

Converters of frequency for management of asynchronous engines have a range of regulation to 250. Converters represent the electronic devices constructed on the basis of microprocessor technics. Programming and their works are carried out from built with the digital or graphic display. Management optimisation is reached automatically after introduction of parametres of the electric motor. In a software possibility of adjustment of a drive and its start-up in operation is put in pawn.

Spindles of machine tools with NPC carries out exact, rigid, with the raised wear resistance of necks, landing and basing surfaces. The spindle design considerably becomes complicated because of the devices of an automatic mode built in it and a clip of the tool, gauges at adaptive management and automatic diagnostics.

Spindle support should provide accuracy of a spindle for a long time in the variable working conditions, the raised rigidity, small temperature deformations. Accuracy of rotation of a spindle is provided, first of all, with high accuracy of manufacturing of bearings.

Most often in support of spindles apply bearings For reduction of influence of backlashes and increase of rigidity of support usually establish bearings with a preliminary tightness or increase number of bodies качения. Sliding bearings in support of spindles apply less often and only in the presence of devices with periodic (manual) or backlash automatic control in an axial or radial direction. In precision machine tools apply aerostatic bearings in which between a neck of a shaft and a

bearing surface there is compressed air, thanks to it deterioration and bearing heating decreases, accuracy of rotation, raise.

### **3 The general data on control systems and machine tools with NPC**

Under management of the machine tool it is accepted to understand set of influences on its mechanisms providing performance of a work cycle of processing, and as a control system - the device or set of the devices realising these influences.

Numerical programmed control NPC is a management at which the program set in the form of the file of the information written down on any carrier. The operating information for systems NPC is discrete and its processing in managerial process is carried out by digital methods. Management of work cycles practically is everywhere carried out by means of the programmed logic controllers realised on the basis of principles of digital electronic computers.

In the purposes and functions of modern multilevel device NPC are listed.  
 Systems NPC practically supersede other types of control systems.  
 The purposes and functions of multilevel devices NPC. (table1)

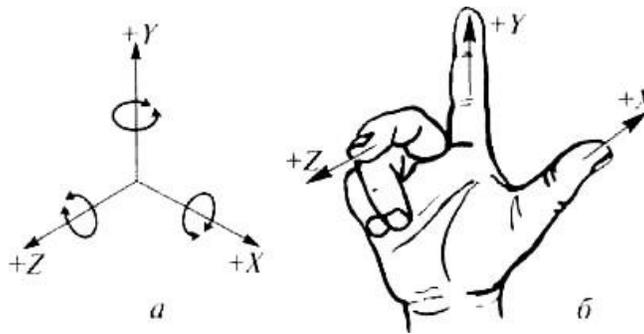
Levels	The purpose	Functions
1	Maintenance of processing of preparations on the machine tool	Management of a cycle of work of the machine tool The control of moving of working bodies of the machine tool
2	Reception of the information on machine tool functioning	Acceptance by the process engineer and (or) the operator of the decision on correctness of work of the machine tool and revealing of malfunctions on the basis of the information on machine tool work
3	Reception of initial data for the manufacture organisation in shop (at factory	Acceptance by the process engineer and (or) the operator on the basis of the information on work of the machine tool of the qualified decisions on production management

On technological appointment and functionality of system subdivide into four groups:

- Item in which set only co-ordinates of final points of position of executive powers after performance of certain elements of a running cycle by them;
- Planimetric or continuous, operating executive office movement on the set curvilinear trajectory;
- Universal (combined) in which programming as movings is carried out at positioning, and movements of executive powers on a trajectory, and also changes of tools and loading-unloading of preparations.
- The multiplanimetric systems providing simultaneous or consecutive management by functioning of some knots and mechanisms of the machine tool.

Example of application of systems NPC of the first group are drilling, boring and koordinatno-boring machine tools. As an example of the second group systems NPC of various turning, milling and circular grinding machine tools serve. Systems NPC

of various multi-purpose turning and drill- freezer -boring machine tools concern the third group.(fig6)



An arrangement of axes of co-ordinates in machine tools with NPC right-hand system of co-ordinates.

The fourth group concern circular grinding machine tools in which from systems. Coperate various mechanisms: Editings, givings of grandmas etc. Exist item,planimetric, combined and multiplanimetric management cycles.

On a way of preparation and input of the operating program distinguish so-called operative systems NPC this case the operating program prepare and edit directly on the machine tool, in the course of processing of the first detail from party or imitation of its processing) and systems for which the operating program prepares irrespective of a place of processing of a detail. And independent preparation of the operating program can be carried out or by means of the computer aids which are a part of system of the given machine tool or out of it (manually or by means of system of automation of programming). NPC.

Programmed controllers are control means machine tool electro automatics The majority of programmed controllers the processor block and programmed memory, and also various modules of inputs/exits have a modular design into which structure enter the power supply. To creation and debugging of programs of work of the machine tool apply programming devices. A principle of work of the controller: Necessary inputs/exits and the obtained data are interrogated analyzed in the processor block. Logic problems and result of calculation are thus solved is transferred to a corresponding logic or physical exit for giving in the corresponding mechanism of the machine tool.

In programmed controllers use various types of memory in which the program of electro automatics of the machine tool is stored: electric reprogrammed non-volatile memory; operative memory with an easy approach; erased by ultra-violet radiation and the reprogrammed.

The programmed controller has diagnostics system: inputs/exits, an error in work of the processor, memory, the battery, communication and other elements. For simplification of search of malfunctions modern intellectual modules have self-diagnostics.

Can contain both geometrical, and the technological information. The technological information provides a certain cycle of work of the machine tool, and geometrical - characterizes the form, the sizes of elements of processed preparation and the tool and their mutual position in space.

Machine tools with programmed control by the form subdivide managements into machine tools with systems of cyclic programmed control and machine tools with systems of numerical programmed control NPC. Systems are more simple, as in them the cycle of work of the machine tool, and sizes of working movings is programmed only, i.e. the geometrical information, are set, for example, by means of an emphasis. In machine tools with NPC management is carried out from on which in a numerical kind it is brought both geometrical, and the technological information.

In separate group allocate machine tools with digital indication and a preset of coordinates. In these machine tools there is an electronic device for the task of coordinates of the necessary points (a preset of co-ordinates) and крестовый a table supplied with gauges of position which gives commands on moving to a necessary position. This on the screen each current position of a table (digital indication) is highlighted. In such machine tools it is possible to apply either a preset of coordinates or digital indication; the initial program of work is set by the machine operator.

In models of machine tools with for a designation of degree of automation letter f with figure is added: F1 - machine tools with digital indication and a preset of coordinates; F2 - machine tools with item and rectangular systems - NPC machine tools with planimetric systems F4- machine tools with universal system for item and planimetric processing. Special group the machine tools having NPC for multiplanimetric processing, for example make circular grinding machine tools. For machine tools with cyclic systems PU in a model designation index with operative systems - index T (for example, 16K20T1) is entered.

NPC provides management of movements of working bodies of the machine tool and speed of their moving at and also sequence of an operation cycle, cutting modes, various auxiliary functions.

The system of numerical programmed control NPC is a set of specialised devices, methods and the means necessary for realisation NPC by machine tools. Device) machine tools is part which is executed as a unit with it and carrying out delivery of operating influences under the set program.

In the international practice following designations are accepted: NC- NPC; HNC -

a version of device NPC the task of the program the operator from the panel by means of keys, switches; SNC - device CH having memory for of the operating program; CNC - management of the independent machine tool with the NPC containing mini computer or the processor; DNC - management of group of machine tools from the general COMPUTER.

For machine tools with NPC directions of movings and their symbolics are standardised. It is accepted to consider as standard R841 for a positive direction of moving of an element of the machine tool at what the tool or preparation depart one from another. An initial axis (axis Z) is the axis of a working spindle. If this axis rotary its position is chosen perpendicularly by planes of fastening of a detail. A positive direction of an axis Z - from the device of fastening of a detail to the tool. Then axes X and Y will settle down how it is shown on .

Use of a concrete kind of the equipment with NPC depends on complexity of a produced detail and seriality of manufacture. The seriality of manufacture less, the the machine tool should have the big technological flexibility. At manufacturing of details with difficult spatial profiles in individual and small-scale manufacture use of machine tools wit NPC is almost unique technically defensible decision. This equipment is expedient for applying and in case it is impossible to make equipment quickly. In a batch production also it is expedient to use machine tools with NPC Recently widely use independent machine tools with systems from such machine tools in the conditions of a readjusted large-lot production.

Basic feature of the machine tool with is a work under the operating program ( on which are written down a cycle of work of the equipment for processing of a concrete detail and technological modes. At change of a detail processed on the machine tool it is necessary to replace simply the program that reduces on 80... 90 % labour input of readjustment in comparison with labour input of this operation on hand-operated machine tools.

The basic advantages of machine tools with NPC

- Productivity of the machine tool raises in 1,5... 2,5 times in comparison with productivity of similar hand-operated machine tools;
- Flexibility of the universal equipment is combined with accuracy and productivity of an automatic machine;
- The requirement for the qualified workers-machine operators decreases, and manufacture preparation is transferred to sphere of engineering work;
- The details made under one program, are interchangeable, that reduces time of fitting works in the course of assemblage;
- Terms of preparation and transition to manufacturing of new details thanks to preliminary preparation of programs, more simple and universal industrial equipment are reduced;

- Duration of a cycle of manufacturing of details decreases and the stock not finished decreases.

4. System NPC can change depending on a kind a way of coding of the information.

In the method of its machine tool (in one or two cases) or it is direct on the machine tool (in pendant or stationary control panels). Drives of givings of machine tools with NPC having a special design and working with concrete device are system component.

All data necessary for processing of preparation on machine tool, receives from which contains two types of information machine tools with NPC the information - co-ordinates of reference points of a trajectory machine tools technological - data

about speed, giving, tool number write down on. In operative systems NPC the program can be entered (by means of keys) directly on the machine tool.

The major technical characteristics of systems NPC is its resolution or step-type behaviour. Is minimum possible size of linear and angular course of the machine tool, corresponding to one operating impulse. Supervised in managerial process. The majority of modern systems NPC.

SunRav BookOffice <<http://www.sunrav.ru/srbo>>

SunRav BookEditor Appointment Program SunRav BookEditor is intended for creation and editing of various electronic books and textbooks. Any book can consist of unlimited quantity of heads, sections and subsections.

Program possibilities the Text with various visual effects (different fonts, the fat, inclined, underlined, crossed out symbols, and as symbols with line over it, interlinear and indexes ).

Work with styles <mk:

MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/500.html> the text.

Paragraphs with various visual effects: the numbered/not numbered/alphabetic lists, borders, colour of a background, alignment, spaces, line spacings etc.

Use of images <mk: MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/300.html> and any OLE-objects <mk:

MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/320.html>

Use of tables <mk: MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/190.html>.

Tables can be enclosed each other.

Use of audio-and video - of files <mk:

MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/437.html>.

Use GIF of animation <mk:

MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/405.html>.

Use of various standard elements Windows <mk:

MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/330.html>: buttons, the lists, dropping out lists, radio groups etc.

Export and import of sections <mk:

MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/280.html> in format HTML and RTF.

Import <mk: MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/380.html> all documents of formats HTML, RTF, TXT from the chosen directory.

If at you it is established MS Office you can import in addition <mk:

MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/380.html> and to export the books from () files MS Office: DOC, XLS etc.

Work with files of format CHM: import <mk:

MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/400.html> books from this format and compilation <mk:

MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/460.html> in this format. By means of the program it is possible to create easily, for example, files of the inquiry for your programs.

Various references <mk:

MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/490.html> will help to facilitate navigation under the book and to start various documents and programs.

Integration with package SunRav <mk:

MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/640.html> - you can make in the textbooks of the reference to tests and the user can pass test during acquaintance with the textbook.

book Opening (a file with expansion srb) by dragging from a conductor on the main window of program BookEditor.

Fast viewing of the created book in program SunRav Book <mk:

MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/20.html> Reader <mk:

MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/20.html>.

And thus the size of electronic books and textbooks is minimum.

SunRav BookOffice <<http://www.sunrav.ru/srbo>>Work with the selected works.

Folder the Selected works - an ideal place for the organisation of sections and books. By means of this folder you can easily get access to your selected chapters (sections) and books. Access to this folder is carried out by means of keys Ctrl+F or point of the menu the Kind/page.

The head - the name of the head (section) of the book.

The book - the book name.

File - a full name of a file of the book (its site). № - number of the head.

To add the current chapter in a folder the Selected works simply click by button The head will appear in a folder the Selected works.

To look the chapter placed in the selected works, simply pass in this folder, and click the mouse index under the name of the head. This if the chapter chosen by you is in other book (not that, that is opened at present) the necessary book will be automatically open.

To remove the head from the elite allocate it, having clicked on it the right key of the mouse, and in the appeared menu choose point to remove from the elite.

You can always keep a folder the Selected works in a file. For this purpose choose point of the menu the Selected works/keep... In the appeared dialogue window enter a file name in which folder contents will be kept.

To return to the kept list of the Elite choose point of the menu the Selected works/open and choose the necessary file with the Selected works.

SunRav BookOffice <<http://www.sunrav.ru/srbo>>Our workings out

SunRav TestOfficePro

The software package for creation of tests, carrying out of testing and processing of results of testing. By means of SunRav TestOfficePro the organisation and testing carrying out in any educational institutions (high schools, colleges, schools) how on purpose to reveal level of knowledge on any subject matters, and with the training purposes is possible. The enterprises and the organisations can carry out certification of the employees. Consists of programs:

tMaker <<http://www.sunrav.ru/srtop/srtmaker.php>> - the program for creation of tests;

Tester <mk: MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm:/640.html> - the program for testing carrying out;

<<http://www.sunrav.ru/srtop/srtadmin.php>> - the program for remote administration of users and processing of results of testing.

By means of a package it is possible to create easily tests in any subjects of the school program, on any High school disciplines, any tests for professional testing, various psychological tests. In the of the test you can use various fonts, formulas, schemes, tables, audio-and video - files, HTML documents and any OLE documents. Any question and the answer it is possible is high-grade to format - various fonts, alignment, paragraphs, lists, the top and bottom indexes This all information is ciphered by methods of proof cryptography.

Program site: <<http://www.sunrav.ru/srtop>> SunRav TestOfficePro.

WEB Package SunRav TestOfficePro. WEB the Internet / the Intranet is intended for the organisation of testing by means of a network. Thetc.) is stored in a database (further - a DB). By means of SunRav TestOfficePro. WEB it is possible:

to Organize tests in sections.

to Register users.

to hold testing both to the registered users, and not registered. registered users, and not registered.

to Look through results of testing.

to Look through results of a rating under the given test.

Keep results of testing in a database.

Program site: <<http://www.sunrav.ru/srtopweb>>us all information (tests, sections of tests, results etc.) is stored in a database (further - a DB). By means of SunRav TestOfficePro. WEB it is possible:

to Organize tests in sections.

to Register users.

to hold testing both to the registered users, and not registered.

to Look through results of testing.

to Look through results of a rating under the given test.

to Keep results of testing in a database.

Program site: <<http://www.sunrav.ru/srtopweb>>

SunRav BookOffice <<http://www.sunrav.ru/srbo>>

Command keys

You can look through books and textbooks using both the mouse, and the keyboard.

The combinations of keys used in program SunRav BookReader <mk are more low resulted: MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/20.html>.

Ctrl+O - To open a book file

F2 - To place the current chapter in the Selected works <mk:

MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/160.html>

F4 - Will include/switch off book scoring <mk:

MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/170.html>

F5 - To pass to book chapter 1

F6 - To pass on previous one after another the head of the book

F7 - To pass to the chapter of the book following an order

F8 - To pass to last chapter of the book

Backspace - to return the head from whom you have followed the link.

Ctrl+F - To find the text in the book

F9 - To include/switch off autoscrolling <mk:

MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/90.html>

F10 - To show/hide the book maintenance <mk:

MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/50.html>

+ on the digital keyboard - to increase a font size <mk:

MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/110.html>.

On the digital keyboard - to reduce a font size <mk:

MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/110.html>.

Ctrl+F5 - To pass on the Maintenance <mk:

MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/50.html>

Ctrl+F6 - To pass on the Index <mk:

MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/140.html>

Ctrl+F7 - To pass on вкладку Search <mk:

MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/150.html>

Ctrl+F8 - To pass on вкладку the Selected works <mk:

MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/160.html>

Ctrl+S - To include a mode of allocation of the text <mk:

MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/890.html>.

Ctrl+H - To include a mode <mk:

MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/890.html>.

SunRav BookOffice <<http://www.sunrav.ru/srbo>>

Parametres of a command line

Program SunRav BookReader can be started with various parametres. It will allow to adjust behaviour of the program more flexibly. These parametres are more low described:

BookFileName.srb - Starts the program and at once opens book BookFileName.srb.

Parametre Action /tester TesterFullPath

Defines a program site tTester <mk:

MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/650.html>. For example,/tester "C:\Program Files\TestOfficePro\tTester\tester.exe" /chapter chapter

At book opening at once shows has undressed (head) chapter. It makes sense only if the file name is set. /id chapterID

At book opening at once shows has undressed (head) ID which it is equal chapterID. It makes sense only if the file name is set. /theme

Name a visual theme of the program /toc + (-)

Shows (hides) the maintenance panel. /tbfile + (-)

Shows (hides) the tool panel the File. a visual theme of the program /toc + (-)

Shows (hides) the maintenance panel. /tbfile + (-)

Shows (hides) the tool panel the File. /tbview + (-)

Shows (hides) the tool panel the Kind. /tbfav + (-)

Shows (hides) the tool panel the Selected works. /tbchapter + (-)

Shows (hides) the tool panel Section. /menu + (-)

Shows (hides) the main menu. /tocimg + (-)

Shows (hides) icons in the maintenance panel. /posx Val

Instal a horizontal position of the program in value Val (in pixels). /posy Val

Instal a vertical position of the program in value Val (in pixels). /width Val

Instal width of the program in value Val (in pixels). /height Val

Instal program height in value Val (in pixels). /fullscreen

Establishes number maintenance panels in value Val (can accept values from 0 to 4).

SunRav BookOffice <<http://www.sunrav.ru/srbo>>

Insert of files

You can insert to (import) to section various documents:

1. Files in format Rich Text Format (RTF).
2. HTML documents.
3. Text files.

If at you software package Microsoft Office its formats of import become accessible to program SunRav BookEditor is established:

4. Documents Word (doc)
5. Documents Excel (xls)
6. HTML documents.
7. Windows Write.

8. Documents the Lexicon for DOS.

9. Etc.

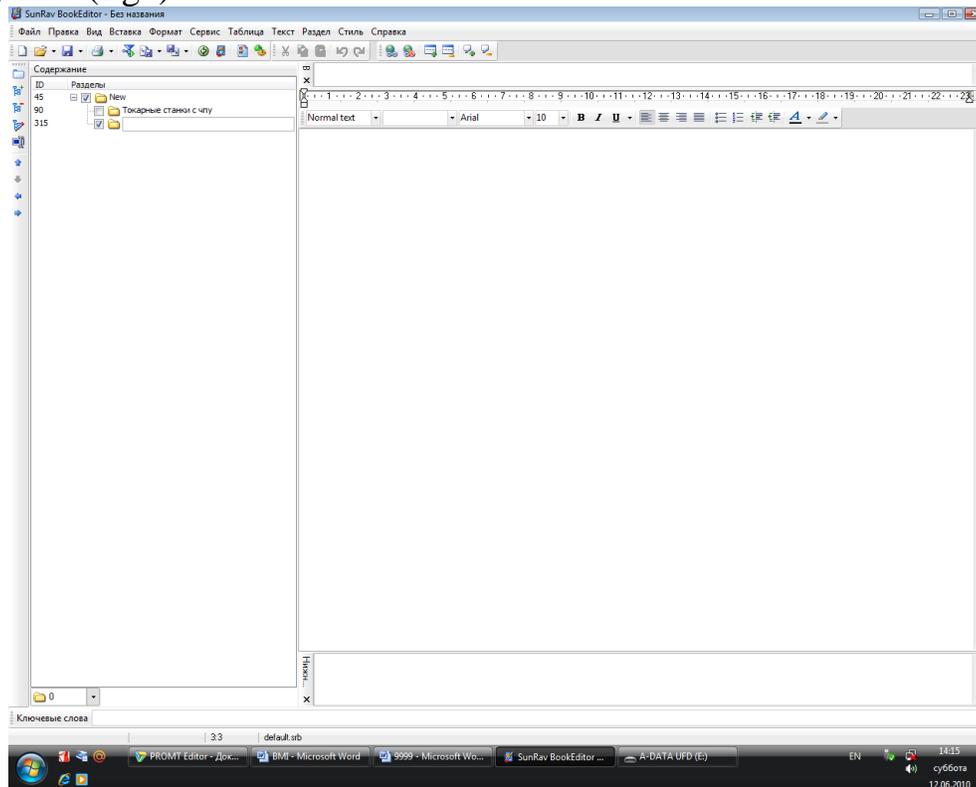
To insert the document (file) into section contents, it is necessary to establish the cursor in a position where the file will be inserted and to press a combination of keys Ctrl+Shift+F or to execute the following:

1. To establish the cursor in a position where the file will be inserted.

2. To click the right button of the mouse.

3. In the appeared contextual menu choose has undressed Import/insert a file or to press button

4. In the appeared standard window establish desirable type of a file and choose the necessary file. (fig7)



SunRav BookOffice <<http://www.sunrav.ru/srbo>>

References to books

Having clicked under the reference of this type, other book will open. For this purpose, what to make such reference to you it would be necessary:

1. To write the reference text.

2. To allocate it.

3. To press button ili of key Shift+Alt+H.

4. In the appeared dialogue window in the field Aim to enter a name of a file of the book. For example MyBook.srb.

The book file should lay in one of the listed places:

In the same folder, as the program (SunRav BookEditor or SunRav BookReader). I.e. if you start the document from program SunRav BookReader the document can lay in a folder

C:\Program Files\SunRav BookOffice\BookReader.

In books programs. For example,

C:\Program Files\SunRav BookOffice\BookReader\docs.

In any other place. The full way to the document in this case should be specified. For example,

C:\MyDocs\Mathematics.doc.

Except book opening, there is a possibility at once to open the certain chapter. For this purpose after the name of a file of the book specify ID chapters:/id 100 - will open the head, ID which it is equal 100.

Besides, probably to set parametres of a command line <mk:

MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/80.html> for definition of some parametres of again opened book. Here an example: breader.exe

"C:\MyBooks\SunRav BookOffice.srb"/id 100/theme Office2003/tbfav-/tbfile  
+ /menu-/posx 0/posy 0

At program start book C:\MyBooks\SunRav BookOffice .srb in this case will open, the head will open, ID which is equal 100, the visual theme of the program will be Office2003, the tool panel the Selected works and the main menu, the tool panel the File will disappear will be shown, the program will appear in the left top corner of the screen.

If the way to a book file is not registered, the program will search for it or in a folder in which it is, or in Books.

SunRav BookOffice <<http://www.sunrav.ru/srbo>>

References to documents

Having clicked under the reference of this type, the document or the program will open. For this purpose, what to make such reference to you it would be necessary:

1. To write the reference text.
2. To allocate it.
3. To press button ili of key Shift+Alt+H.
4. In the appeared dialogue window in the field Aim to enter a name of a file of the document or the program. For example readme.txt.

The document or program file can lay:

In the same directory, as the program (SunRav BookEditor or SunRav BookReader). I.e. if you start the document from program SunRav BookReader the document can lay in a directory

C:\Program Files\SunRav BookOffice\BookReader.

In a subdirectory docs programs. For example,

C:\Program Files\SunRav BookOffice\BookReader\docs.

In any other place. The full way to the document in this case should be specified. For example,

SunRav BookOffice <<http://www.sunrav.ru/srbo>>

## Bookmarks

In any place of the text you can establish a bookmark. Bookmarks happen very useful to creation of references <mk: MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/492.html>. They allow to follow the link at once to the place of page defined by a bookmark.

For this purpose, what to create a bookmark to you it would be necessary:

1. To allocate the text which becomes a bookmark.
2. To press keys Shift+Alt+B or to choose point of the menu Editing/bookmark.
3. In the appeared dialogue window to enter the bookmark name. In the same section there should not be bookmarks with the identical name.
4. To press the button APPRX.

Now this bookmark will appear in the list of bookmarks the Bookmark during creation <mk: MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/492.html> references <mk: MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/492.html>.

SunRav BookOffice <<http://www.sunrav.ru/srbo>>

## Command keys

Keys

Action

File

Ctrl+N

To create the new book

Ctrl+O

To open the book

Ctrl+S

To keep the book

Shift+Ctrl+S

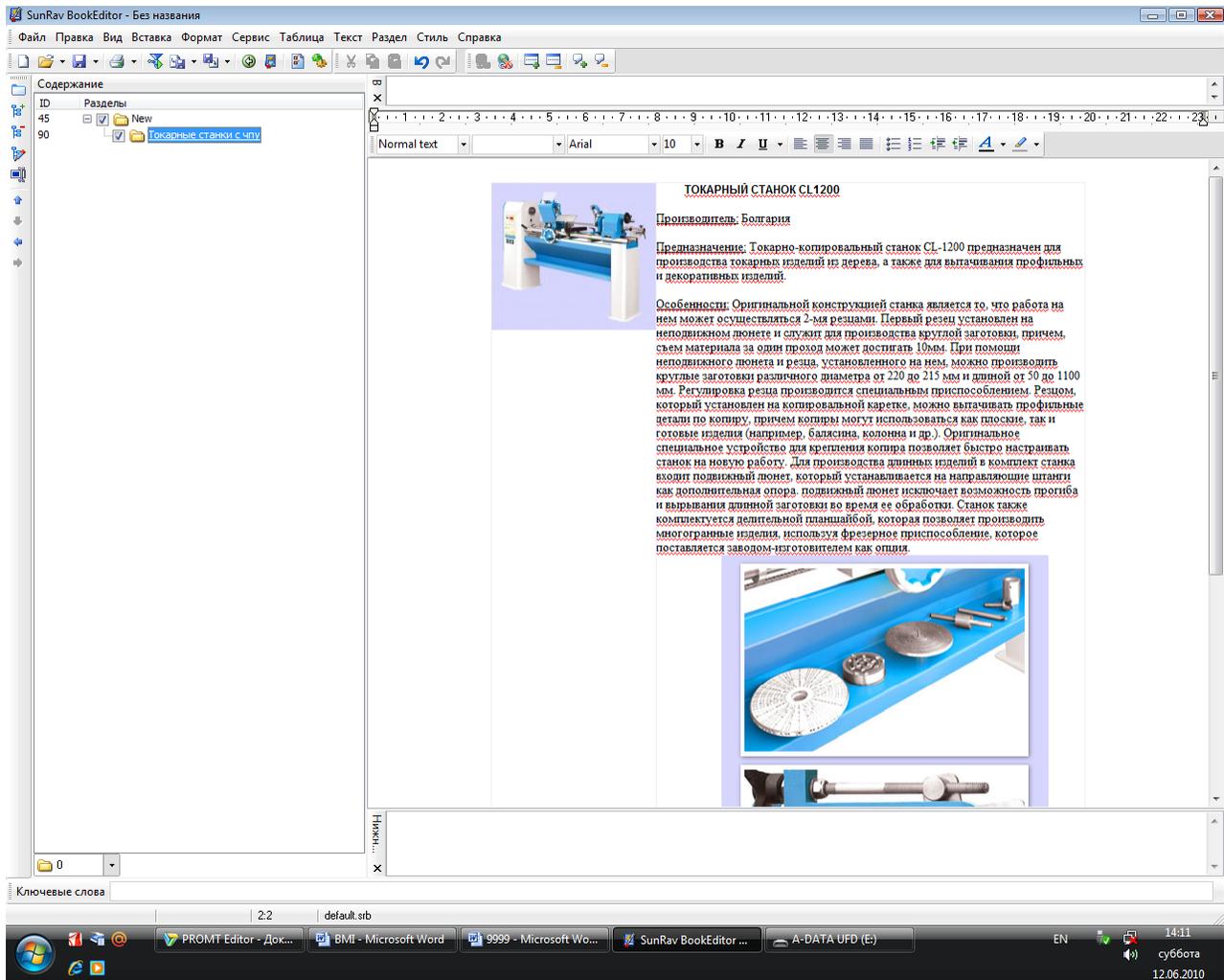
To keep the book under a new name Shift+Ctrl+P

To pack the book <mk:

MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/830.html> in ZIP archive

Ctrl+E

To export <mk: MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/430.html> the book(fig8)



To export <mk: MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/430.html> the book

Shift+Alt+I

To import <mk: MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/390.html> a folder

Shift+Alt+I

To import <mk: MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/400.html> from CHM a file

Ctrl+P

To unpack <mk: MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/485.html> all book

Alt+P

To unpack the maintenance <mk: MSITStore:C:\PROGRA~1\SUNRAV~1\srTo pack the book <mk: MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/830.html> in ZIP archive

Ctrl+E

To export <mk: MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/430.html> the book

Shift+Alt+I

To import <mk: MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/390.html> a folder

Shift+Alt+I

To import <mk: MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/400.html> from CHM a file

Ctrl+P

To unpack <mk: MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/485.html> all book

Alt+P

To unpack the maintenance <mk:

MSITStore:C:\PROGRA~1\SUNRAV~1\bo.chm::/488.html> books

F4

To open the book <mk:

MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/420.html> in program SunRav BookReader>F10

To show properties of the book <mk:

MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/560.html>F9

To compile the book <mk: MSITStore:

C:\PROGRA~1\SUNRAV~1\srbo.chm::/850.html> in executed (exe) a file>Alt+X

To close the program>Editing>Ctrl+Z

To cancel last action>Shift+Ctrl+Z

To repeat last action> Ctrl+X

To cut out the allocated text in the buffer of exchange Windows>Ctrl+C

To copy the allocated text in the buffer of exchange Windows >CTRL+Î

To insert contents of the buffer of exchange Windows into the text. >Ctrl+A

To allocate all text Shift+Alt+B

To establish a bookmark Ctrl+F

Search in the book Ctrl+R

Search and replacement> Insert> Shift+Alt+P

To insert the image <mk:

MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/300.html>

Shift+Alt+F

To insert a file <mk: MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/310.html>

To insert the reference <mk:

MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/490.html>

Shift+Alt+S

To insert a symbol

Shift+Alt+M

To insert Flash a roller <mk:

MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/453.html>

Shift+Alt+V

To insert audio/video a file <mk:

MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/437.html>

Shift+Alt+G

To insert animated GIF a file <mk:

MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/405.html>

Shift+Alt+L

To insert a horizontal line <mk:

MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/340.html>

Shift+Alt+O

To insert OLE object <mk:

MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/320.html> (formulas, tables, etc.)

Format

Shift+Ctrl+F

Choice of a font allocated the text

Ctrl+Alt+B

Parametres of a framework and paragraph pouring

Shift+Ctrl+B

Choice of a background of the head (the image, colour...)

Service

F7

Spelling

Shift+Ctrl+F2

Program parametres <mk:

MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/510.html>

Shift+Ctrl+T

To insert the maintenance <mk:

MSITStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/870.html>

To copy a background of the current chapter in other chapters

The table

Shift+Alt+T

To insert the table

Alt+Num 5

Alt+Num 5(fig9)

The screenshot shows the SunRav BookEditor interface. On the left is a table of contents with 45 numbered sections. The main text area displays the following text in large, stylized fonts:

220-06 гр  
валиев жамшид  
 ВКР  
станки с чпу

Below the text is an image of a lathe machine. The software's taskbar at the bottom shows several open applications, including PROMT Editor, A-DATA UFD, диплом станки с чпу, BMI - Microsoft Word, and Doc1 - Microsoft W... The system tray indicates the time is 13:57 on Saturday, 12.06.2010.

To allocate the table

Section

Shift+Ctrl+Ins

To create new the head of top level

Ins

To insert the new chapter

F2

To rename the head

Shift+Ctrl+E

To export the head

Ctrl+Alt+P

Toprintthead<mk: MSITSStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/487.html>

Alt+BkSpace

To return back under the reference

Ctrl+F5

To pass to chapter 1

F5

To pass to the following chapter

F6

To pass to the previous chapter

Ctrl+F6

F2

To rename the head

Shift+Ctrl+E

To export the head

Ctrl+Alt+P

Toprintthead<mk: MSITSStore:C:\PROGRA~1\SUNRAV~1\srbo.chm::/487.html>

Alt+BkSpace

To return back under the reference

Ctrl+F5

To pass to chapter 1

F5

To pass to the following chapter

F6

To pass to the previous chapter

Ctrl+F6

To pass to last chapter

Shift+Ctrl+Alt+E

To develop all maintenance

Shift+Ctrl+Alt+C

To curtail all maintenance

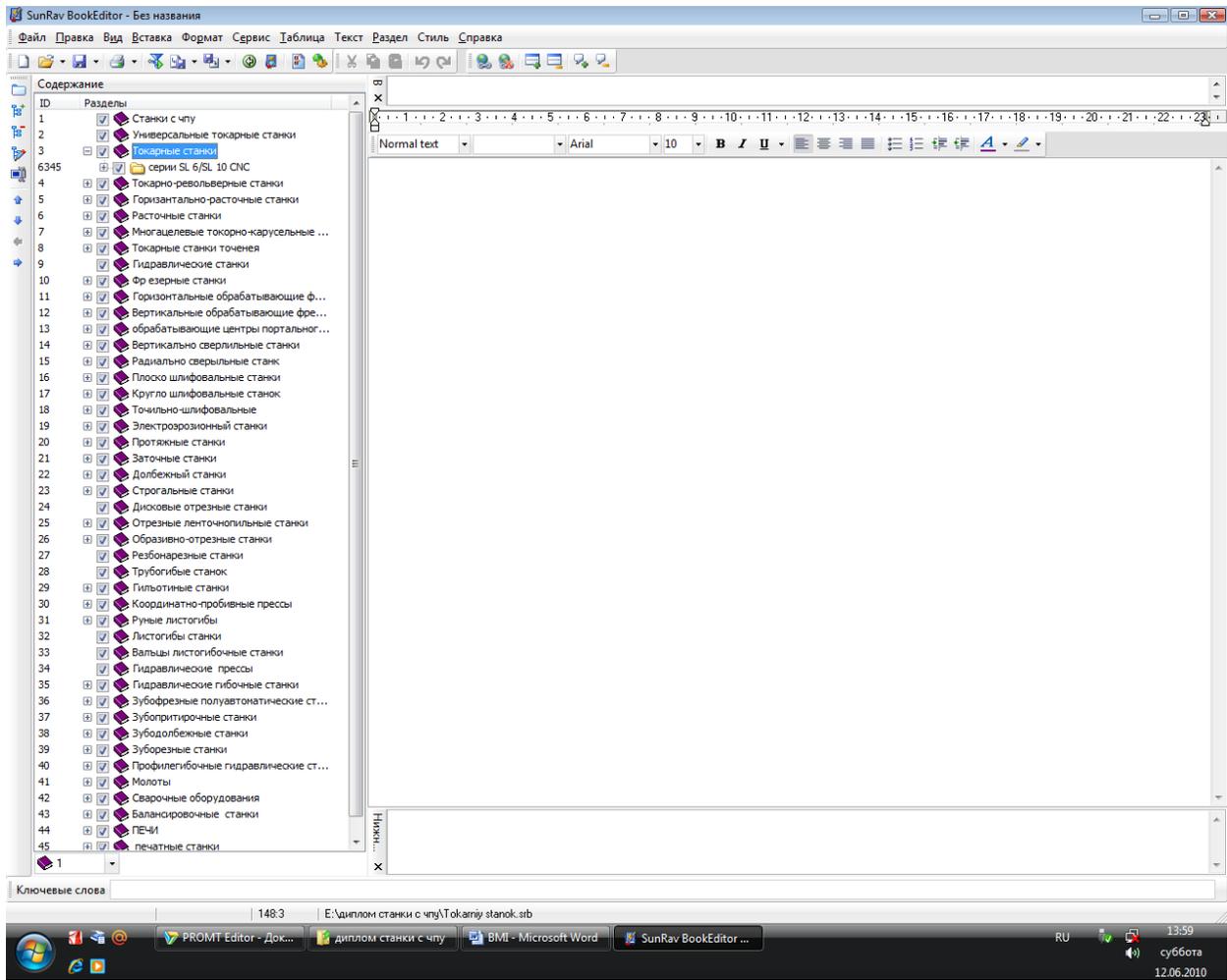
The inquiry

F1

To show the inquiry on work with the program

Ctrl+F1

To show a window "About the program"(fig11.12.13.)



SunRav BookEditor - Без названия

Файл Правка Вид Вставка Формат Сервис Таблица Текст Раздел Стиль Справка

Содержание

- 1 Станки с чпу
- 2 Универсальные токарные станки
- 3 Токарные станки
- 4 Токарно-револьверные станки
- 5 Горизонтально-расточные станки
- 6 Расточные станки
- 7 Многошпиндельные токарно-карусельные ...
- 8 Токарные станки точения
- 9 Гидравлические станки
- 10 Фрезерные станки
- 7740 MCV-300
- 7785 FANUC XD-30; XD-40
- 7830 XK 7130
- 11 Горизонтальные обрабатывающие ф...
- 12 Вертикальные обрабатывающие фре...
- 13 обрабатывающие центры портальный...
- 14 Вертикально сверлильные станки
- 15 Радиально сверлильные станки
- 16 Плоско шлифовальные станки
- 17 Кругло шлифовальные станки
- 18 Точношлифовальные станки
- 19 Электроэрозионные станки
- 20 Протяжные станки
- 21 Заточные станки
- 22 Долбежные станки
- 23 Строгальные станки
- 24 Дисковые отрезные станки
- 25 Отрезные ленточнопильные станки
- 26 Образно-отрезные станки
- 27 Резбонарезные станки
- 28 Трубогибные станки
- 29 Гильотинные станки
- 30 Координатно-пробивные прессы
- 31 Ручные листогибы
- 32 Листогибы станки
- 33 Вальцы листогибочные станки
- 34 Гидравлические прессы
- 35 Гидравлические гибочные станки
- 36 Зубофрезные полуавтоматические ст...
- 37 Зубоприточные станки
- 38 Зубодобельные станки
- 39 Зуборезные станки
- 40 Профилигибочные гидравлические ст...
- 41 Молоты
- 42 Сварочные оборудования
- 43 Балансировочные станки

147:29 C:\Users\Домашний\Desktop\Токанни станок (2).srb

13:49 суббота 12.06.2010

## Фрезерные станки с ЧПУ

### XK 7130



[Описание](#)

**Предназначен для выполнения всех видов фрезерных работ, сверления, зенкерования металлов и сплавов в условиях единичного и серийного производства. Оснащен с плавного изменения частоты вращения шпинделя.**

**Технические характеристики:**

<b>Размеры рабочей поверхности стола, мм</b>	<b>1000x280</b>
<b>Перемещение стола, мм, не более: продольное</b>	<b>480</b>
<b>- поперечное</b>	<b>210</b>
<b>Угол поворота шпиндельной головки, град</b>	<b>45?</b>

SunRav BookEditor - Без названия

Файл Правка Вид Вставка Формат Сервис Таблица Текст Раздел Стиль Справка

Содержание

1 Станки с чпу  
 2 Универсальные токарные станки  
 3 Токарные станки  
 6345 серии SL 6/SL 10 CNC  
 4 Токарно-револьверные станки  
 6660 IB340F30  
 5 Горизонтально-расточные станки  
 6750 R611  
 6795 TPX61  
 6 Расточные станки  
 6885 RSLX6511  
 6930 RSX6511 x 2/III  
 6975 RSX6511 x 2/IV  
 7 Многошпиндельные токарно-карусельные ...  
 7065 VBL 2000  
 8 Токарные станки точения  
 7200 ЧПУ LA155030  
 7245 АРТ-906  
 9 Гидравлические станки  
 10 Фрезерные станки  
 11 Горизонтальные обрабатывающие ф...  
 12 Вертикальные обрабатывающие фре...  
 13 обрабатывающие центры портальног...  
 14 Вертикально сверлильные станки  
 15 Радиально сверлильные станки  
 16 Плоско шлифовальные станки  
 17 Кругло шлифовальные станки  
 18 Точно шлифовальные  
 9270 ТШ-1; ЗП631  
 9315 ТШ-2; ТШ-3; ЗП634  
 19 Электроэрозионный станки  
 9360 серии EDM  
 9405 SK40  
 9450 DK77  
 10080 B5020  
 20 Протяжные станки  
 9630 7A733  
 9675 МП7A621-043  
 9720 7A523  
 9765 МП7A635  
 21 Заточные станки  
 9810 БЗ-389  
 9855 БЗ-221  
 22 Долбежный станки  
 9900 7402  
 9945 ГД200  
 0

Normal text Arial 14

**BMD электроэрозионный прошивной станок**



**BMD электроэрозионный прошивочный станок - супердрель.**

**Супердрели предназначены для быстрой прошивки отверстий в детали.**

**аналог: электроэрозионных станков производства Sodick, AGIE, Троицкий станкостроительный завод**

**Специализированные электроискровые (электроэрозионные) (ЭЭ) станки, в которых электродом служат латунные трубки D 0.2 - 3.0 мм.**  
**Через электрод-трубку во время работы под давлением прокачивается специальная ЭЭ жидкость (негорючий диэлектрик [на водяной основе]).**  
**"Супердрели" позволяют получать отверстия значительно быстрее традиционных методов, а также "сверлить" там, где получение отверстий в твердых металлах механическими способами практически невозможно.**  
**После получения отверстия возможна дальнейшая обработка заготовки на проволочно-вырезном станке.**



Ключевые слова

148:63 E:\диплом станки с чпу\Токarniy станок.srb

PROMT Editor - Док... диплом станки с чпу BMI - Microsoft Word SunRav BookEditor ...

RU 14:03 суббота 12.06.2010

## 6 HIGHLY EFFECTIVE TURNING PROCESSING OF DETAILS FROM AND PIECE PREPARATIONS

turning processing of difficult details with a step and curvilinear profile;  
 automatic the mechanism of a clip round (20-40 mm) and шестигранных (S=19-32 mm) in a draw-in attachment, and also piece preparations (to 200 mm) a cartridge;  
 under the special order the machine tool is completed with the giving device прутка in diameter 40-55 mm, established in a capstan;  
 a drive of rotation of a spindle;  
 the electric motor of a direct current capacity of 15 KW;

a drive of givings;  
direct current electric motors complete with ball screw steams;  
the unloading of details from a working zone at processing is carried out by the unloading device;  
length to 3000 mm are established in a protective pipe with two racks;  
under the special order the machine tool is made with a complete set an automatic rotary cartridge for processing of details of type transfers, squares, etc.

#### Technical characteristics

Parametre

Value

The greatest diameter of the preparation established, mm:

Over a bed-400

The greatest diameter of processed preparation, mm-200

The greatest length of processed preparation, mm-120

Quantity of positions of the tool in a capstan-8

System NPC -NC-210

Distance from an end face of a spindle to a capstan, mm-226-530

The greatest cross-section moving of a capstan, mm-110

Frequency of rotation of a spindle, rpm-10-2500

Limits of givings of a revolving support, mm/mines:

The longitudinal-1-2500

The cross-section-1-1250

For the machine tool with a rotary cartridge:

Height of a clamped detail, mm-15-75

Distance from an axis of turn to a detail end face, mm-100

Corner of turn of a detail for one working course, a hailstones-60,9

Capacity of the electric motor-15, kw

Overall dimensions, mm:

Length-3850

Width-1880

The cutting tool is a component of the complex automated system of the machine tool. To a careful choice and preparation of the tool for machine tools with NPC and the special attention should leave. It is connected with high cost of this equipment and necessity of achievement of the maximum productivity and higher accuracy of processing. For maintenance of an automatic cycle of work of these machine tools higher degree of reliability of work of the tool is required.

The cutting tool for machine tools with NPC should meet following requirements to maintenance of high and stable cutting characteristics to satisfactory formation and

shaving tap to maintenance of the set conditions on processing. Universality for typical processed surfaces of various details on different models of machine tools. At readjustment on other processed detail or replacement of the become blunted tool.

The modular tool with replaceable many-sided plates allows to raise operational qualities of the tool, provides considerable economy of scarce cutting materials. At the same time favorable conditions for wide application more - and cutting materials are created. The modular tool with has found wide application, its release increases, as on volume, so on relative density of such tool makes today 35-40 % of total amount of release of the cutting tool. Search of ways of decrease in the cost price of manufacturing of the tool and increase of flexibility of tool manufacture has led to unification of a design at the expense of wide application inserts, cartridges and heads in which are established. Interchangeability of inserts, cartridges and heads for various types of cutting tools allows to create their scales by kinds and the sizes and the big groups of the tool in so-called systems. In aggregate with a set of extension pieces, standard, standard and special shafts such systems are convenient means of satisfaction of requirements for the tool and data to a minimum of a share of individual orders. Thus on working out of a design and tool manufacturing it is required less expenses. For drawing up of various types of the tool the certain number of replaceable elements which after assemblage represent the interconnected mechanism possessing sufficient resultants by rigidity and accuracy is used. Such method allows to create the combined tool with the least expenses. The cutting tool in the conditions of flexible manufacture should be readjusted with reference to change of the nomenclature of processed details by reconfiguration of the unified interchangeable knots. The problem of maintenance of reliability of cutting tools dares creation of new tool materials with raised - and temperature constancy, durability and hardness. As materials for manufacturing the tool for machine tools with NPC use: firm alloys, ceramics, synthetic materials and fast-cutting steels. Firm alloys are subdivided into four groups: tungsten, titano-tungsten. They differ on a chemical compound, to-mechanical and operational properties. On classification firm alloys irrespective of a chemical compound are subdivided depending on their suitability for processing of certain materials into three groups. Each group is designated by the letter and colour (dark blue, yellow or red) and divided into the subgroups characterising concrete appointment of firm alloys: P (dark blue) - alloys for processing of the carbonaceous and alloyed steel; M (yellow) - intermediate or universal, - alloys for processing of the malleable cast iron, the alloyed steels inclined to adhesions, and also steels raised; To (red) - alloys for processing grey and bleached, the nonferrous metals, the tempered steel, plastic and wood. For the purpose of reduction of the nomenclature and increase of universality of application of firm alloys, improvement of their structure and properties it is spent at the

expense of additional them by carbides of the titan, tantalum, , raising heat - and wear resistance firm alloys ruthenium raises their firmness to shock loadings and improves viscosity. Application of these alloys at face milling allows to raise firmness of the tool in 3 times even without application of coverings. The basic direction of increase of working capacity xalloys is drawing on them of the coverings raising firmness of the tool in comparison with the uncovered tool, applied in the same areas, in 3-4 times. As coverings apply basically carbide of the titan in the thickness of 5-6 mm, put a method (CVD), and the nitride of the titan put by a - vacuum method (PVD) on installations of type "Damask steel". Ceramic plates for cutting tools make pressing and sintering of components. White the ceramics consists of 99 % aluminium ( $Al_2O_3$ ) and does not contain a binding material. High hardness of a basis and it predetermines good cutting properties of ceramics, however durability ceramics is on a low level (250-350 H/MM<sup>2</sup>). Durability of ceramics increase addition of carbides in particular carbide of the titan (so-called black ceramics). This durability increases by a bend to 700-750 H/MM<sup>2</sup>. Now both kinds of the ceramic cutting tool are used. Most widely apply marks ceramics B-3 BOK-60 in accordance with GOST 25003-81 and BO-13 on THAT 48-19-411-87. The basic scope of these marks - fair and semifair the tempered steels and grey. Processing of the constructional, alloyed and fast-cutting steels is possible. At processing of steels speed of cutting .Following scopes of a composite .

## **7. Schemes a carving profile a cutter.**

Sizes of givings  $S_r$ , on one cutter at vortical in rotating heads are resulted by cutters in of Item and. On one tooth of an edge mill - in Item., and on one tooth of a disk mill - in the note to this table. Taps, dies, and carving heads work with self-giving. Speed of cutting, m./minute a fixing carving cutters with plates from a firm alloy At vortical metric and carvings cutters in rotating heads. Values of factor  $C_v$ , and exponents are resulted in item. The general correction factor for speed of the cutting, considering actual conditions of cutting,

$$K_v = K_{mr} * K_{ur} * K_{cr} = 0.9 * 0.8 * 0.48 = 0.345$$

$$V = \pi * D * f / 1000 * t * P = 3.14 * 25 * 1.2 / 1000 * 0.015 * 2.5 = 2.512 \text{ M/s}$$

Where D - nominal diameter of a carving, mm; width of bore for a cutter exit, mm; P - a step of a cut carving, mm; t - time for tap of a cutter and machine tool switching for the reverse motion, equal 0,01-0,04 minutes

Speed of cutting, m/mines, at нарезании a metric carving taps, round dies and carving heads

$$V = S_v * D^q / T^m * S^y * K_v = 244 * 0.85 / 70 * 0.3 * 0.345 = 14.81 \text{ M/s}$$

1 about at carving edge mills with.

$$V = S_v / T^m * S^x * S^y * K_v = 244 / 70 * 0.05 * 0.3 * 0.345 = 80.1 \text{ M/s}$$

Values of factor  $C_v$ , exponents and average values of the period of firmness T for various tools are resulted in item. Data about firmness for a number of tools rough as in these cases speed of cutting do not count, and establish, meaning, that the qualitative carving at its dies can be received at speed  $V < 4$  m/mines, and screw-cutting heads - at speed  $V < 14$ -H6 the m./minute productive and economic carvings is reached by taps and edge carving mills at the maximum speeds of cutting supposed by rapidity of the equipment and capacity of its drive. The general correction factor,  $K_g = K_{mr} K_{Hr} K_{Tr}$ , where factors to. And  $K_{Hr}$ , considering processed and tool materials for carving cutters, are resulted in taps, dies, carving heads and carving edge mills in Item As well as factor  $K_{Tr}$  considering accuracy of a cut carving. Power dependences. A tangential component of force of cutting, H, at carvings cutters.

Where  $K_{mr}$  - the factor considering quality of the processed material  $K_{Hr}$  a considering material of a cutting part of the tool  $K_{cr}$  - the factor considering a way of a carving (accept equal 1,0 if the carving is cut draught both fair by cutters, and 0,75 if the carving is cut by one fair cutter).

$$P_z = C_p * 10 * P^y / i^n = K_p = 10 * 103 * 0.9 / 3 = 303 * 0.35 = 108.15$$

The twisting moment, H-м, at carvings taps, carving heads

$$M_{kp} = 10 * C_m * D^q * P^y * K_p = 10 * 0.025 * 0.85 * 103 * 0.35 = 7.66$$

Where P - a carving step, mm; i - the number of working courses established by tab. of Item 38, Item 39.; D - nominal diameter of a carving, mm.

Factors  $C_p$  and  $s_m$  and exponents are resulted in tab. II the Correction factor  $K_p = K_{mp}$

considering quality is processed define for cutters on the other tools  
Capacity, kw, at carvings: cutters

$$N = P_z V / 1020 \cdot 60 = 109 \cdot 80.1 / 1020 \cdot 60 = 0.142$$

Taps, dies and carving heads

$$N = M_n / 975 = \text{and } n = 1000v / JID = 1000 \cdot 14.8 / 3.14 \cdot 25 = 188$$

At vorticol carvings for one pass of a rotating head with z cutters capacity of cutting, kw, define under formulas: for a triangular carving with

$$N = 0.28 \cdot S^{1.2} \cdot S_z^{0.6} \cdot Z^{0.5} \cdot 1 \cdot V^{0.8} / D^{0.7} = 0.028 \cdot 0.4^{1.2} \cdot 0.05^{0.6} \cdot 0.9^{0.5} \cdot 80.1^{0.8} / 25^{0.7} \\ = 0.0346 \text{ N.M}$$

At carvings for some passes, and also at a non-standard carving the calculated on the actual height of a profile which are cut off for one pass, to carving height state that cut.

## 8.1 The Labour safety in the automated Manufactures

Operation of the automated manufactures is connected with a traumatism which takes place at repair and service of lines more often. This an immediate cause of accidents is imperfection of protection frames, inefficient systems of removal of a shaving, lacks of designs of conveyors etc. Operation of removal of ready details from conveyors is dangerous.

At the device of automatic transfer lines are guided by the rules of a labour safety stated above. However it is necessary to take into consideration and a number

additional, characteristic for the given case of requirements of a labour safety. So, management of automatic transfer line work is necessary for conducting from the central control panel. It does not exclude necessity of presence of starting arrangements at the separate units which have been built in a line. Working conditions on control panels. For periodic change of the tool, and machine tools with NPC and automatic machines, their greasing and cleaning, and also small repair in a cycle of work of the automatic transfer line special time should be provided. All listed works should be carried out on the disconnected equipment. Repair of all devices automatic FADE, located below floor level drives of conveyors, the special hatches providing an easy approach to them should be provided. A floor and necessarily blocked with starting systems of lines to exclude possibility of their inclusion in work at carrying out of repair work. Scraper conveyors, systems should be applied to waste disposal for limits of automatic transfer lines. The requirements of a labour safety considered at the organisation and operation of technological complexes by industrial robots, are defined by methodical recommendations about safety maintenance at introduction of industrial robots on sites with adverse working conditions in mechanical engineering, secret the All-Union Central Council of Trade Unions.

The lay-out of the robotised technological sites should provide convenient and safe access of attendants to the core and movings. Minimum possibility of occurrence of strangers. The control panel industrial robots should take places out of working space of the industrial robot round it enough place that to the operator the unimpeded access to the button of emergency switching-off and the good review has been provided should be provided. The robotised technological sites are necessary for protecting and designating alarm colours and safety signs according to requirements. The input in a protection zone should be blocked with a control system. Blocking should disconnect the industrial robot working in an automatic mode, at an input of the person in a protection zone. At calculation of the area of a protected zone follows ruptures between. The process equipment for convenient a performance of operations of programming, training, repair and the control of the industrial robot. It is necessary to consider system of co-ordinates of the robot, type and number of industrial robots, and also data and a working pose of the operator at performance of various operations on service of the industrial robot. The protection design should not complicate carrying out of the visual control by the operator behind work site. The recommended height of a protection-1300 of mm from floor level provided that distance from an actuation mechanism of the industrial robot to a protection makes not less than 800 mm. The protection is recommended to be carried out from the pipes sheathed by a metal grid with cells 60X60mm. Protections should be painted according to requirements of in the form of alternating inclined under a corner 45-60 ° strips in width of 150-200 mm. Yellow alarm and

black colours at a parity. Width of strips 1:1.

At moving by the industrial robot of preparations and details at height over passes, prodrivings and places with a view of accident prevention it is necessary to provide protective grids or other devices warning falling of moved details under a zone of movement of the manipulator of the industrial robot. Working conditions in cabins of posts of management of robots should meet corresponding requirements to constant workplaces of the industrial premises. Safe receptions and methods of carrying out of work should be applied to maintenance of safe working conditions at industrial robots and technological complexes with industrial robots along means of maintenance of safety (protective, safety, blocking, signalling and other devices) also and strictly to be observed the regulated modes of operation of industrial robots and other process equipment, and also. Prior to the beginning of work of the industrial robot it is necessary to remove extraneous subjects, tools, devices from its working space. At impossibility of their removal for a protection they should be established out of reach actuation mechanisms of the industrial robot. Categorically it is forbidden to be in working space of the industrial robot at its work in an automatic mode.

Speed of moving of actuation mechanisms of the industrial robot during programming and training of the industrial robot should not exceed.

It is forbidden to perform works on joining and a detachment devices of the industrial robot without preliminary switching-off of the last from the power supply. Operations of programming and training of the industrial robot should be made by operators with use portable (remote) ' the panel of justices –Rules under safety precautions and norms on industrial sanitary. In safety precautions are defined as system of organizational actions and the means preventing influence on working dangerous production factors, and industrial sanitary as system organizational, the means preventing or reducing influence on working harmful production factors. Rules under safety precautions contain the requirements of technical character directed on protection. Subjects working from influence and means of labour, safe work of cars, the equipment and tools, supply of machine tools and cars constructive protections and safety adaptations. Sterns but industrial sanitary and hygiene of work define the device of industrial and household premises, workplaces according to physiology and hygiene of work, and also safe limits of the maintenance in air of industrial premises ached, gases, steams. Rules and norms after the safety precautions and an arbitrariness it is necessary for foamy sanitary to observe both at designing, and at operation of industrial targets, the equipment. Requirements in the field of maintenance safe and healthy. the work, containing in rules and norms under safety precautions and industrial sanitary, are obligatory both for administration, and for workers and employees. At non-observance of these rules and norms guilty persons bear legal responsibility.

## 8.2 The sphere of action of a rule and norm under safety precautions and industrial sanitary there are the general.

Uniform for all branches of a national economy, interbranch and branch. The general, uniform rules and norms under safety precautions and industrial sanitary, extend on all branches of a national economy and fix the major guarantees of safety and hygiene of work. Level of these guarantees should be identical in all branches of a national economy. Interbranch rules and norms under safety precautions and industrial sanitary fix the major guarantees of safety and hygiene of work or in several branches, or in separate kinds of manufactures, works or on separate types of the equipment in any branches of a national economy. Such rules and norms (uniform for all branches of a national economy or interbranch) confirm Ministerial council of the or under its commission other state bodies in common or in coordination with the All-Union Central Council of Trade Unions.

Branch rules and norms under safety precautions and industrial sanitary extend. On separate branch of manufacture all country also contain guarantees of safety and hygiene of the work, specific to concrete branch.

Branch rules and norms under safety precautions and industrial sanitary confirm when due hereunder the ministries, departments, bodies of the state supervision of observance of rules on a labour safety in common or in coordination with the Central Committee of trade unions. At absence in the rules named above and norms of the requirements which observance by manufacture of works is necessary for maintenance of safe working conditions, the administration of the enterprise (establishment) in coordination with trade-union committee takes the measures providing safe working conditions. The norms establishing measures of an individual defence working from occupational diseases and industrial traumas concern number of norms under safety precautions and industrial sanitary. These norms provide the following. On works with harmful working conditions, and also on the works made in special temperature conditions or connected with pollution, the worker and the employee the special clothes, special footwear and other means of an individual defence stand out free of charge on the established norms. Workers and employees are obliged to use means of an individual defence given out to it in working hours. On the works connected with pollution, the worker and the employee soap stands out free of charge on the established norms. On works where influence on a skin of harmfully operating substances is possible, washing off and neutralising means stand out free of charge on the established norms. On works with harmful working conditions worker and employee milk or other equivalent foodstuff stand out free of charge on the established norms. On works with especially harmful working conditions a treatment-and-

prophylactic food is given free of charge on the established norms. For workers and the employees occupied on works with harmful working conditions, the reduced duration of working hours no more than 36h in week is established and additional annual. The administration of the enterprise (establishment) is obliged to supply free of charge workers of hot shops with the aerated added some salt water. Workers and the employees occupied on heavy works and on works with harmful or dangerous working conditions, and also on the works connected with movement of transport, pass obligatory preliminary at receipt for work and periodic medical inspections for definition of their suitability to charged work and preventions of occupational diseases. To workers and the employees working in a cold season on open air or in closed premises, the loaders occupied on cargo handling works, and also in the cases provided by the legislation, special breaks for heating and rest which join in working hours are given to other categories of workers. Workers and the employees requiring on a state of health in granting of easier work, the administration of the enterprise (establishment) is obliged to translate from their consent to such work according to medical certificate temporarily or without term restriction.

Now at us in the country mutual coordination of numerous norms and rules under safety precautions and industrial sanitary both all-union, and branch value takes root in which frameworks are made specifications and technical documentation ordering on safety of work.

The component of the state system of standardization it represents a complex of the interconnected standards directed on maintenance of safe working conditions, preservation of health and working capacity of the person in the course of work, the decision of this problem is provided by standardization of safety requirements. Inclusions of these requirements in standards and specifications on all kinds of serially let out production.

Organizational-methodical positions on system construction;

Requirements and norms by kinds of dangerous and harmful production factors;

The organisation on before conducting the analysis of the reasons of the industrial and occupational diseases dock of entering of requirements the safe; I will hold down also the technological documentation; works on maintenance fire acceptance.

Them parametres, and standards of a subsystem 1 by kinds dangerous, both harmful a proiz -ditch and maximum permissible values a quality monitoring of normalized parametres of dangerous harmful-production factors. In standards of a subsystem 2 are reflected: general safety requirements to the industrial equipment, safety requirements to separate groups of the industrial equipment, a quality monitoring of performance of safety requirements. Standards of a subsystem 3 establish general safety requiremonitoring and estimations of

protection frames.ments to productions, to separate groups of technological processes, a quality monitoring of performance of safety requirements. In standards of a subsystem 4 are resulted: classification of protection frames, requirements to separate classes and kinds of protection frames, a quality monitoring and estimations of protection frames.

### **8.3 Electric components enterprises.**

The correct choice of types and capacity of lamps makes solving impact on operational qualities and economic efficiency of lighting installations, on conformity of artificial illumination to requirements shown to it. At comparison of light sources with each other and at their choice use following characteristics:

- 1) electric (rated voltage in electric capacity of a lamp in watts);
- 2) Lighting (the light stream radiated
- 3) lumens, the maximum force of light.
- 4) Paradise it is set for some lamps instead of light on.
- 5) Current/max.
- 6) Operational (light return of a lamp )
- 7) In  $\text{lm/Vt}$ , i.e. The relation of a light stream of a lamp to it.
- 8) Electric capacity  $\tau \gg -F/R$ ; service life, in that.
- 9) Number full service life  $\tau$  - total time a grief.
- 10) More than on 20 %. I.e. Time economically .
- 11) Different operation of a lamp);

Constructive (the form of a flask of a lamp, - the form of a body of heat - rectilinear, spiral, and even at some special lamps; presence and structure .

Gas-discharge lamps are devices in which radiation of an optical range of a spectrum results from the electric category in atmosphere of inert gases and steams of metals, and also at the expense of the luminescence phenomenon. The basic advantage of gas-discharge lamps before is the big light return - 40-ON  $\text{lm/Vt}$  ON, metallo - galogennye to 100, luminescent to 75, mercury to 60, to 40  $\text{lm/Vt}$ ). life which at some types of lamps reaches 8-12 thousand ч. From gas-discharge lamps it is possible to receive a light stream practically in any part of a spectrum, selecting in appropriate way inert gases and steams of metals in which atmosphere there is a category. Gas-discharge lamps have a number of essential lacks radiations of gas-discharge lamps can lead to occurrence of pulsations of a light stream. By consideration of quickly moving or rotating details in a pulsing stream there is a stroboscopic effect which is shown in distortion of visual perception of objects of distinction (instead of one subject images of several are visible, the direction and speed of movement) are deformed. The pulsation of a light stream worsens conditions of visual work, and the stroboscopic effect conducts to increase in danger of a traumatism and does impossible successful

performance of some industrial operations. It is necessary to apply two-of a light stream of gas-discharge lamps and three-phase inclusion in a network or consistently to include ballast, capacitor or inductive resistance. Pressure at ignition at gas-discharge lamps usually considerably above pressure of a network, therefore for inclusion of lamps it is necessary to apply difficult starting adaptations. At some types of lamps the period an last 10-15 minutes during this time electric and lighting characteristics of change. Gas-discharge lamps can create a radio noise which exception also demands special devices. The most widespread gas-discharge lamps are luminescent, having the form of a cylindrical tube. The internal surface of a tube is covered by a thin lay which serves for transformation of the ultra-violet radiation arising at the electric category in steams of mercury, to visible .Depending on distribution of a light stream on a spectrum by application different distinguish some types of lamps a daylight.

## **9 The conclusion**

the task on Final Qualifying Work in work is given classification of various machine tools with is applied in structure cars the Resulted design features of

machine tools with NPC, the general data on control systems of machine tools with NPC

On the basis of generalization of these data working out a database of machine tools with NPC

For convenience of work with a database its structure in quality Electric library on the basis of program SunRav BookEditor.

Further for an example **Highly effective** turning and a choice of a mode of cutting at machining of details of cars

## **10 .The Literature list and references but the Internet materials**

1. Система автоматического контроля размеров деталей и инструментов на станках с ЧПУ. - Новосибирск: Изд-во НГТУ, 1995.

2. Троицкий Я.Н. Система автоматизированного проектирования приводов подачи станков с ЧПУ: Учеб. пособие. - Новосибирск: Изд-во НЭТИ, 1992.

SunRav BookOffice <<http://www.sunrav.ru/srbo>>

Program site: <<http://www.sunrav.ru/srtop><<http://www.sprut.ru>

mkm@uni.udm.ru;http://ulm.uni.udm.ru/~prs  
lihtinov@orc.ru  
http://www.system.oao-ni.ru/pubpobedit.php  
www://каталог//фрез/станки.ru  
http://turner.narod.ru/dir1/sverlenie.htm  
http://turner.narod.ru/dir1/zenkerovanie.htm  
www://каталог//токарный.станки//чпу/.ru  
http://turner.narod.ru/dir1/sverlo.htm  
http://kuem.ru/iiii.html  
http://history.rsuh.ru/historycd/HISTORY/HTML/T3/T3-02-15.htm  
http://www.систем станки.htm  
http://каталог.станки чпу. //.ru  
http://тех. характеристики//станки. ru