Operations on Smooth Miller and Thicknessing Miller – Course: Mechanical woodworking techniques. Methodical guide for instructors

Table of Contents

Operations on Smooth Miller and Thicknessing Miller – Course: Mechanical woodworking techniques. Methodical guide for instructors

Institut für berufliche Entwicklung e.V.
Berlin

Original title:
Methodische Anleitung für den Lehrenden
“Arbeiten an Abricht– und Dickenfräsmaschinen”

Author: Johannes Schollbach

First Edition © IBE

Institut für berufliche Entwicklung e.V.
Parkstraße 23
13187 Berlin

Order No.: 93–32–3402/2

1. Aims and Contents of the Training in the Working Techniques of “Working at Smooth and Thicknessing Millers”

After having finished their training based on this lesson, the trainees shall have achieved the following aims:

– They know the construction and the function of the smooth miller and the thicknessing miller.

– They are able to mill broad and narrow faces plane, angular and to thickness.

– They can control by themselves the quality of the milled surfaces.

– They know that correct milling of the broad and narrow faces is decisive for the further treatment of the workpieces.

– They know the danger of accident and the use of protection devices and auxiliaries for the prevention of accidents.

In order to achieve the above aims, the following contents must be taught.

Contents

– Purpose of milling
– Construction and function of the smooth miller and the thicknessing miller
– Operating sequence of milling.

2. Organizational Preparation

In order to ensure that the instructions, demonstrations and exercises go off smoothly, the training must be well prepared.

This includes the following measures:

2.1. Planning the Training in the Working Techniques of “Working at Smooth and Thicknessing Millers”

– The theoretical teaching is done in a class room or in other suitable facilities with one group of trainees.

– After that the instructor demonstrates how to work at the smooth and thicknessing miller.

– The following exercises are done by one trainee only. (The order of the trainees is set up before.)

– Waiting periods for the rest of the trainees are bridged by other job orders.

– It is recommendable to make a time schedule for the before mentioned training sections.

This time planning depends on the training conditions given.

2.2. Preparation of Labour Safety Instructions

Prior to the demonstrations and exercises the trainees must be instructed in brief on how to prevent accidents.

It is recommended to prepare a book and to note down all instructions given. The trainees should then confirm by their signature that they have been instructed accordingly.

The priorities are:

– Safety devices at the machine are not to be removed or to make ineffective.

– Make use of auxiliaries to avoid accidents.

– Detected faults affecting the operational security of the machine are subject to registration. The machine must be immediately switched off.

– Make use of ear protectors when working.

– The working place must be permanently in good order.

2.3. Making Available the Necessary Teaching Aids

– The theoretical instructions should be given at a place where the trainees are able to make notes, preferably a class–room with desks and blackboard or with seatings and tables.

– Demonstration models of unmachined and machined broad and narrow faces are to make available.

– The Trainees' Handbook of Lessons “Working at Smooth and Thicknessing Millers” is to hand over to each trainee.

2.4. Making Available Working Materials

– The working material “Instruction Examples for Practical Vocational Training – Milling at Smooth and Thicknessing Millers” is to be handed out to the trainees before starting the exercises.

– The following machines are recommended as basic equipment for the training in the course “Machining of Material”: band sawing machine, circular saw, bench smooth miller, thicknessing miller, drilling machine, shaping machine, wood turning lathe, grinding machine, top spindle moulder.

– The materials which are necessary for carrying out the exercises should be prepared in a sufficient number based on the workshop sketches of the instruction examples “Milling at Smooth and Thicknessing Millers”.

– Feeding disk, solid steel squares, slide gauge and folding rule are to be prepared.

– Before starting the exercises check the smooth and thicknessing millers for functionality and safety according to the labour safety requirements.

3. Recommendations for the Realization of the Training in the Techniques of "Working at Smooth and Thicknessing Millers"

The following sections give recommendations as there are the teaching of the trainees, the demonstrations in the working method and how to do the exercises and controls.

3.1. The Introductional Instruction

The introductional instruction should be given in a room having desks and seatings for the trainees.

The instruction should predominately be given in the form of a lecture including a question – answer talk with the trainees. Demonstration models and existing pictures should be used as teaching aids.

Special emphasis should be given to the danger of accidents and the observance of labour safety.

The "Trainees' Handbook of Lessons" corresponds in its structure to the introductional instruction. The main points with respect to the content can be tought in the given order. During the instruction the trainees are to be urged to note down necessary complements or answers to questions in their "Trainees' Handbook of Lessons".

Purpose of milling at the smooth miller:

By comparing the machined and unmachined workpieces demonstrate the trainees the purpose of milling.

It is recommendable to make use of demonstration models.

Construction and mode of operation of the smooth miller:

The instruction on the construction and the mode of operation of the smooth miller is to be given at the machine.

The trainees are to take their place at the smooth miller and the instructor has to take care that everyone can see his operation and no trainee stands behind his back. The following has to be shown to the trainees at a secured machine (secured against unintended starting):

– method of operation of the cutter spindle

– adjustability of the tables

– adjustability of the stop bars

– mode of operation of the safety devices

– putting the workpieces on the feeding table and guiding them via the cutter spindle to the unloading table

– pressure shift of the hands during milling

– possibilities for making use of auxiliaries for preventing accidents

– After this demonstration the machine is to start for a short time paying attention to the labour safety regulations in order to make the trainees familiar with the noise intensity of the

machine.

– Point out the necessity of ear protectors.

Setting of the smooth miller and milling of the workpieces

Now demonstrate the milling of broad and narrow faces. Show the trainees how to correctly put the workpieces on the feeding table, to set the cutting depth and to guide the workpieces over the cutter spindle to the unloading table. After that stop the machine.

All movements done during milling should be explained by the trainees once again.

The trainees must be shown how to check their milling work. They must recognize that milling surfaces in good quality is important for the further treatment of the workpieces.

The exemplary work and handling of the instructor who gives the demonstrations is decisive for the motivation of the trainees who have to master this work by themselves at the end of this course.

Milling at the thicknessing miller

The introductional instruction on “Milling at the Thicknessing Miller” is to be done in the same way like the instruction on “Milling at the Smooth Miller”.

Purpose of milling at the thicknessing miller:

Workpieces machined on the smooth miller are finished to size at the thicknessing miller. Show the trainees milled broad and narrow faces on demonstration models.

Construction of the thicknessing miller:

Do the instruction on the construction of the thicknessing miller at the machine.

The trainees are to take their places in such a way that everyone can see the operations of the instructor.

Demonstrate the trainees at a secured machine (secured against unintended switch on) the following:

– mode of operation of the cutter spindle

– mode of operation of the feeding rollers

– switch on and switch off the feeding gear

– purpose and mode of operation of the pressure beams

– mode of operation of the rebound protection

– adjustability of the machine table

– mode of operation of the table rollers

– adjustability of the rate of feed

– After this demonstration the machine is to start for a short time paying attention to the labour safety regulations in order to make the trainees familiar with the noise intensity of the machine.

– Point out the necessity of ear protectors.

Setting of the thicknessing miller and milling of the workpieces

Now demonstrate the milling of broad and narrow faces. Demonstrate the trainees the correct placing of the workpiece on the machine table and the pushing in up to the point it is picked up by the feed roller.

After that switch off the machine. Carry out dimensional inspection. All movements done during milling should be explained by the trainees once again.

Emphasis should be given to:

– setting of the given dimensions
– push in the workpieces parallel to the machine edge
– taking notice of the maximum chip removal
– adjustability of the rate of feed
– milling of working parts being of different thickness.

The exemplary work and handling of the instructor who gives the demonstration is decisive for the motivation of the trainees who have to master this work by themselves at the end of this course.

They must recognize that milling of surfaces accurate to measurement and in good quality is important for the further treatment of the workpieces.

Dimensional inspection is to be done by the trainees themselves.

3.2. Exercises

The introductional instruction followed by demonstration was done **with one group of trainees**.

Often there is no more than one machine available. Therefore the exercises can be done by one trainee only.

The order of the trainees for doing the exercises should be fixed during the introductional instruction.

Having finished the course “Manual Working of Material – Planing” the trainees have good previous knowledge of the purpose of surface treatment.

The previous demonstrations showed the trainees the method of milling broad and narrow faces at the smooth and thicknessing miller.

The exercises should be done according to the “Instruction Examples for Practical Vocational Training”. They contain specifications of the necessary material and auxiliaries as well as of measuring and testing tools.

They also describe the sequence of operations. Again a short teaching instruction should be prepared for each exercise which shows the trainees a finished workpiece.

Instruction examples

In order to give a survey of the practising pieces which should be made to apply the imparted knowledge, each instruction example is briefly prescribed in the following:

Instruction example 2.1: Frame piece

The broad face of a ledge is milled to get a plane surface.

Instruction example 2.2: Frame piece

The narrow face of the ledge of instruction example 1 is milled at an angle of 90° to the broad face.

Instruction example 2.3: Frame piece

The surfaces of the ledge being machined in the preceding instruction examples are milled to thickness.

Instruction example 2.4: Grating

Practice the milling of broad and narrow faces on the smooth and thicknessing miller for the production of ledges for a bar grate.

Instruction example 2.5.: Wall shelf

Practice the milling of broad and narrow faces of piece parts at the smooth miller.
Practice milling to thickness and to width on the thicknessing miller.
After that the piece parts are to be assembled.

Instruction example 2.6.: Frame

Practice the milling of broad and narrow faces to thickness and to width in order to produce frame ledges.

It is possible to choose other practising pieces than those given in the instruction examples if they are suited to practice the technique of milling on the smooth and thicknessing miller.

The instructor must have produced the practising piece by himself to know all the problems of its production. The instruction examples must have been presented to the trainees so that they can look up or reread and take notes.

The trainee works alone and machines the workpiece by himself starting with cutting to size of the basic material carried out in the course “Working at Circular Sawing Machines” up to the finished workpiece.

The working examples should be marked with the names of the trainees

– to rate the training results separately or in complex

– to explain the trainees the importance of working in best quality when joining piece parts to final products.

Under supervision and direction of the instructor the exercises are carried out by the trainees. They should never do their exercises without supervision.

The trainees should make use of ear protectors. Only one trainee is working at the machine. Several trainees may distract each other and thus cause accidents. The remaining trainees of the group are to keep busy with other jobs. Before starting the exercise the trainees should be informed on the criteria of evaluation.

Criteria of evaluation may be:

Setting of the smooth miller

– Has the working width been set correctly?
– Has the depth of cut been set correctly?
– Are the workpieces placed at hand?

Working at the smooth miller

– Were the workpieces put on the feeding table in the right way?
– Has the workpiece been guided over the cutter spindle under the right pressure shift?
– Have the machined workpieces been put away correctly?
– Did the trainee make use of ear protectors?

Working at the thicknessing miller

– Has the correct rate of feed been choosen?
– Has been taken notice of the maximum chip removal?
– Have the machined workpieces been put away correctly?
– Has been paid attention to order and cleanliness at the working place?
– Did the trainee make use for ear protectors?

Control of quality

– Did the trainee check his machined workpieces?
– Does the result meet the demands of quality?
– Are the broad faces plane all over?
– Is the narrow face at right angles to the broad face?
– Are the workpieces accurate to measurement?

Other criteria of assessment may be determined by the instructor according to the training conditions. These points of assessment too, are to make known to the trainees before starting the exercises.

3.3. Examples for Recapitulation and Tests

This section contains questions to strengthen and test the knowledge and skills acquired. The corresponding answers are also given. Questions marked with the letter “A” are also contained in the “Trainees' Handbook of Lessons”.

1. “A” What is the purpose of milling on the smooth miller?
(milling of a plane broad face and milling of a narrow face being at an angle to the broad face)

2. How is the mode of operation of the smooth miller?
(chip removal by rotary movement of the cutter spindle)

3. “A” Which setting is done at the feeding table of the mill?
(setting of the depth of cut)

4. To which height is the unloading table set?
(to the flying circular height of the cutters)

5. “A” What is the stop bar of the smooth miller for?
(It serves to guide the workpieces when milling narrow faces)

6. “A” What is the feeding table for?
(for an accident–proof treatment of short workpieces)

7. How are longer workpieces are put on the feeding table?
(with the hollow broadside or narrow side)

8. Why is it not allowed to put machines into operation having no safety device?
(because of the high danger of accident at all woodworking machines)

9. “A” Why is to make use of ear protectors?
(because of the high noise pollution of the machines)

10. How is the planeness of the broad face controlled?
(by laying one workpiece on the top of the other)

11. “A” Why is the left cover of the cutter spindle adjustable?
(to set the working width)

12. Where should the workpieces to be machined be stored?
(ready to hand)

13. “A” What is the purpose of milling on the thicknessing miller?
(to mill to thickness and width the workpieces milled on the smooth miller)

14. Why is the machine table vertically adjustable?
(to set the intended thickness and width of the workpieces to be milled)

15. “A” What are the sliding rollers in the machine table for?
(to reduce the friction of the workpieces on the table)

16. How does the feed operate bringing the workpieces through the thicknessing miller?
(by feed rollers)

17. “A” What should be done if there is a feed stoppage?
(first switch off the feed gear and than the cutter spindle)

18. “A” Which task and function do the both pressure beams have?
(to prevent a flutter effect of the workpiece when milling it)

19. “A” Which function does the rebound protection have?
(to prevent a throwing out of the workpiece by the cutter spindle)

20. “A” At which rate of feed can I reach the best quality of the milled surface?
(at the lowest)

21. “A” How do you check the dimensional accuracy?
(with the folding rule or sliding gauge)