

Setting and Operation of Shaping Machines – Course: Techniques for Machining of Material. Instruction Examples for Practical Vocational Training

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Setting and Operation of Shaping Machines – Course: Techniques for Machining of Material. Instruction Examples for Practical Vocational Training

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Introduction

This material contains four selected instruction examples which serve the purpose of applying and consolidating the knowledge of setting and operation of shaping machines.

Shaping machines are used to produce mainly fiat surfaces, shoulders, grooves and similar shapes. They belong to the basic equipment of every mechanical workshop and are required both in the repair sector and in the construction of means of production. To facilitate preparation and carrying out of work, the necessary materials, tools, measuring and testing means and auxiliary equipment are indicated for each instruction example.

Furthermore, previous knowledge, necessary in addition to the knowledge of the technique of setting and operation of shaping machines, is mentioned. It is recommended to repeat this previous knowledge before starting with the work.

The sequence of operations given in each case includes the order of steps leading to setting and operation of the shaping machine. In order to reach a good quality, it is necessary to follow this order of steps.

The instruction examples 2 and 3 are provided with a working drawing from which the required shapes and dimensions of the workpiece shall be taken. It is also possible to choose other workpieces having larger or smaller dimensions. The sequence of operations is preceded by explanations on the working drawings. The admissible deviations for sizes without tolerances can be taken from the following table:

Nominal size	Admissible deviation in mm
0.5 – 6	± 0.1
6–30	± 0.2
30 – 120	± 0.3
120 – 315	± 0.5

Instruction example 1.1: Operation of control elements

The operation of control elements shall be practised on a shaping machine with mechanical drive.

Required previous knowledge

Reading of drawings, labour safety regulations

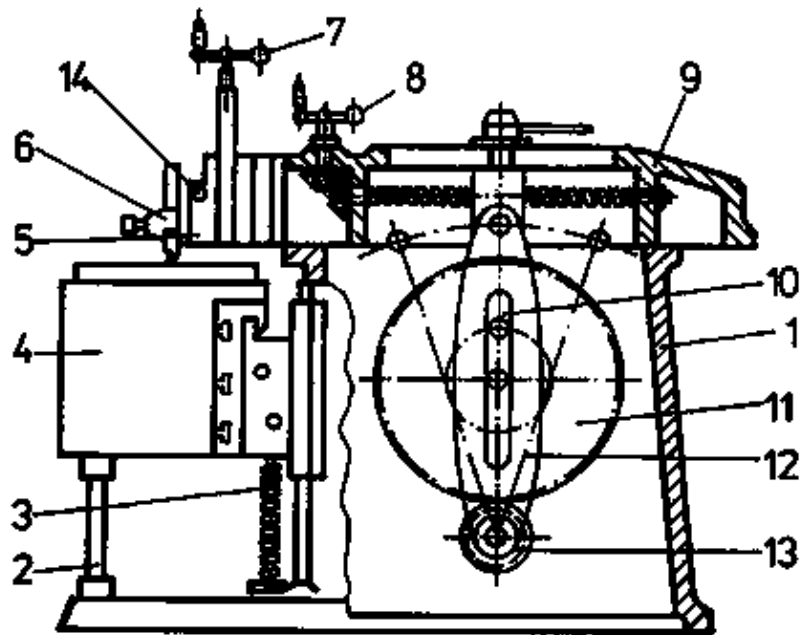
Explanations to the working drawing

- 1 Machine column (frame),
- 2 Support for table,
- 3 Spindle for height adjustment of the table,
- 4 Machine table,
- 5 Ram head,
- 6 Clamping mechanism for tools (tool post),
- 7 Crank for feeding the shaper tool,
- 8 Hand crank for setting the position of the ram stroke,
- 9 Ram,
- 10 Sliding block,
- 11 Main-driving gear with crank,
- 12 Oscillating slider crank mechanism,
- 13 Toothed gear driven by toothed gear,
- 14 Ram clapper

Sequence of operations

Remarks

- | | |
|---|---|
| 1. Set ram speed (speed of forward movement and return speed) | Note graphical symbols of shaping machine. Determine the number of double strokes from tables of recommended values, or by calculation. Carry out control exercises only when machine is at rest. |
| 2. Set stroke length and position of ram stroke | With the corresponding handles or cranks it is possible to change the stroke length and the position of the ram stroke, to vary the ram speed and to move the tool in the necessary manner. Ram positioning becomes necessary for adjustment to the length of the surface to be machined of workpiece length and position of the ram stroke in relation to the workpiece. |
| 3. Set feed | Transverse motion of the table with the workpiece firmly clamped on it. It is guided from the main gearing over the feed gear (arranged on the control side of the machine) to the table spindle. Coupling is actuated by means of control lever. Appropriate arrangement of control elements on the control side makes work easier. |
| 4. Set cutting depth | Move the tool by means of the crank of the tool slide and set the desired cutting depth. |



				1.1.
	Shaping machine			3401

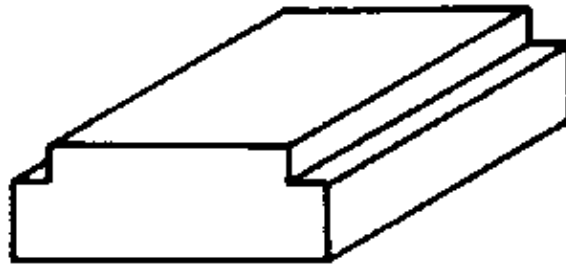
Shaping machine

Instruction example 1.2.: Choice of working means

Choice of working means shall be practised while making a cover strip.

Material

16 MnCr 4 (low-alloy steel; 0.16 % carbon; 1 % manganese; less than 1 % chromium, the rest being iron)



Dimensions

185 x 60 x 24

Tools

Straight left-hand roughing tool, parting-off tool with a width of 6 mm

Measuring and testing means

Steel tape, vernier caliper, depth gauge

Auxiliaries

Hammer, wrench, machine vice, parallel strips, clamping bolts

Required previous knowledge

Reading of drawings, measuring and testing, kinds and application of clamping and auxiliary equipment

Explanations to the working drawing

All surfaces are finish-machined.

Sequence of operations

Remarks

- | | |
|--|---|
| 1. Mount vice | Choice according to the size of the workpieces. Alignment – parallelism and angularity in relation to primary motion. |
| 2. Place parallel strips | Size according to the workpiece to be machined. |
| 3. Clamp workpiece | Locating and supporting surfaces must be free from dirt and chips. |
| 4. Clamp tool for making the cut surface | Clamp straight left-hand roughing tool short and firmly. |
| 5. Set cutting values | Length of stroke, position of ram stroke, $v = 30 \text{ m/min}^{-1}$, feed $s = 0.2 - 0.5 \text{ mm}$ |
| 6. Make cut surface – thickness 20 mm | Infeed according to scale value. |

7. Clamp tool for making the parallel surfaces

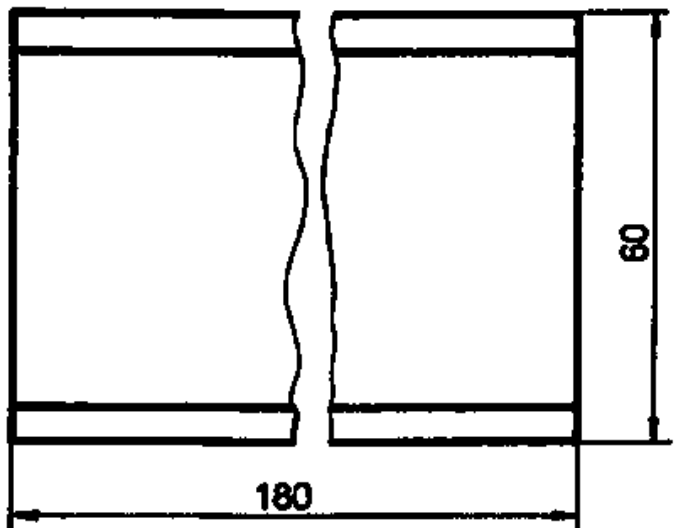
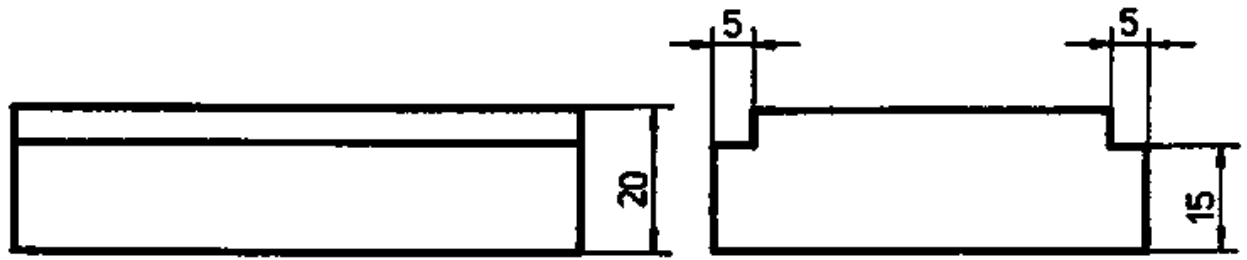
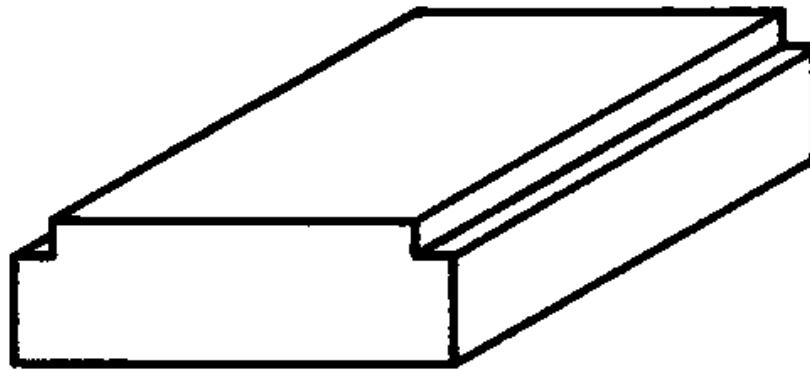
Parting-off tool with a width of at least 6 mm.

8. Make parallel surfaces according to working drawing

Scratch side surface, adjust 5 mm table, infeed according to scale value.

9. Declamp the workpiece and deburr it

10. Make dimensional check



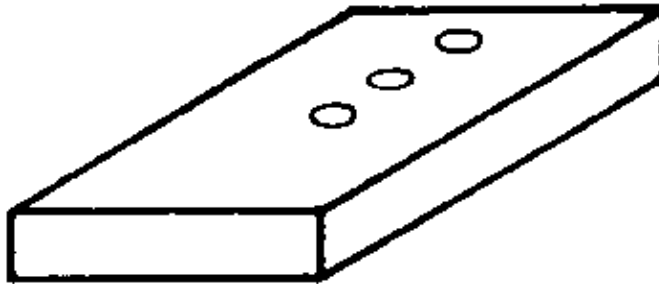
				1.2.
7	Cover strip			3401

Instruction example 1.3.: Clamping and adjusting of workpiece and tool

Clamping and adjusting of workpiece and tool shall be practised while making a guide rail.

Material:

20 MnCr 5 (low-alloy steel; 0.2 % carbon, 1.2 % manganese, less than 1 % chromium, the rest being iron)



Dimensions

285 x 42 x 18

Tools

Straight left-hand roughing tool

Measuring and testing means

Steel tape, vernier caliper, depth gauge

Auxiliaries

Hammer, wrench, magnetic chuck, stop bars, clamping bolts

Required previous knowledge

Reading of drawings, measuring and testing, kinds and application of clamping and auxiliary equipment

Explanations to the working drawing

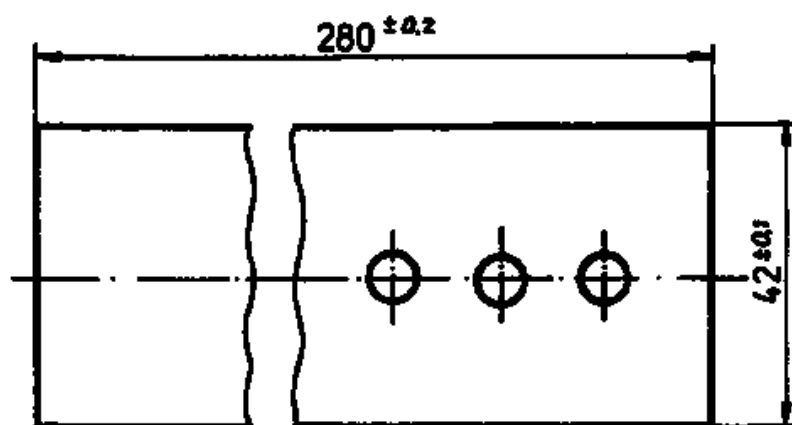
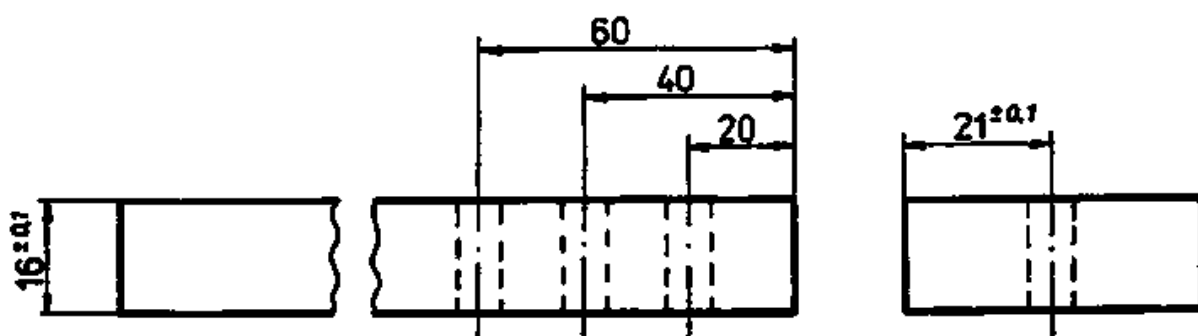
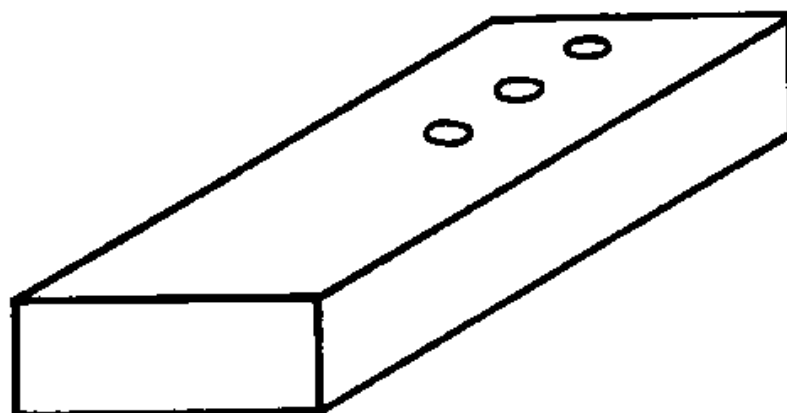
All surfaces are finish-machined.

Sequence of operations

Remarks

- | | |
|--------------------------------------|---|
| 1. Setting of table – magnetic chuck | Note freedom of motion. Attach magnetic chuck by clamping bolts on the machine table. Place stop bars. Take into account that cutting forces act towards stop bars. Great forces occur during shaping which makes firm and safe clamping necessary. |
| 2. Clamp workpiece | Take care to ensure that there are no chips or dust between magnetic chuck and workpiece. |

- | | |
|--|--|
| 3. Align workpiece | Align for parallelism. |
| 4. Clamp tool | Use straight left-hand roughing tool. Tighten the tool by means of the clamping screw of the tool post. Clamp the tool as short as possible to avoid bouncing or chattering (tool breakage). Cross-section of shank must be sufficiently stable. |
| 5. Adjust tool | Adjust ram head and tool vertically to the surface to be machined. |
| 6. Set cutting values | Length of stroke, position of ram stroke, $v = 20$ to 40 m/min^{-1} , feed $s = 0.2 - 0.5 \text{ mm}$ as required |
| 7. Make parallel surface (thickness 16 mm) | Clamp and adjust the workpiece. |
| 8. Declamp and deburr the work-piece | |
| 9. Make dimensional check | |



				1.3.
11	Guide rail			3401

Instruction example 1.4.: Care and maintenance of the shaping machine

These operations shall be practised on a shaping machine

Required previous knowledge

Reading of drawings, construction of shaping machines

Explanations to the working drawing

Clean and lubricate sliding points: 1, 2, 3, 4

Lubricate with the oil can: 5, 6, 7, 8, 9, 10, 11

Sequence of operations

Remarks

(Kind of maintenance work)

(cycle of maintenance work)

1. Clean guideways.

daily

2. Lubricate according to lubrication schedule.

daily, weekly, quarterly, half-yearly

3. Clean machine.

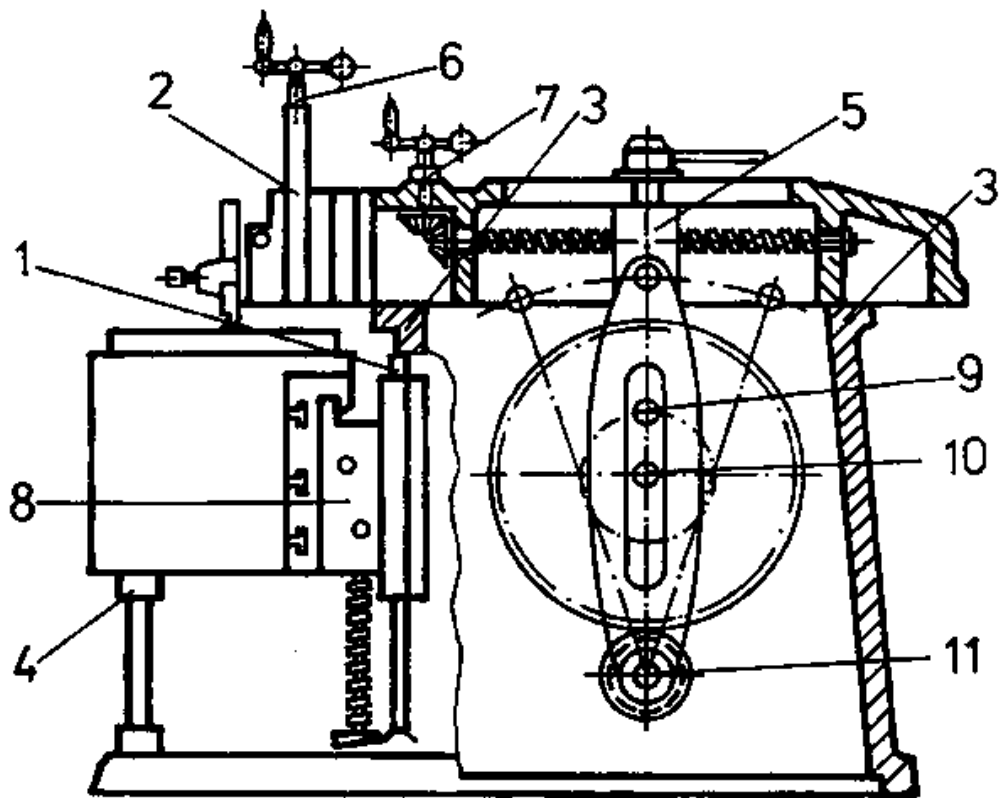
daily

4. Check bearing clearance.

annually

5. Check contactors and limit switch.

quarterly by qualified service specialist



				1.4.
	Lubrication schedule - shaping machine			3401 ₁₄

Lubrication schedule – shaping machine

