

Scraping of Plane Surfaces – Course: Technique for Manual Working of Materials. Instruction Examples for Practical Vocational Training

Table of Contents

Scraping of Plane Surfaces – Course: Technique for Manual Working of Materials. Instruction

<u>Examples for Practical Vocational Training</u>	1
<u>Introduction</u>	1
<u>Instruction example 6.1. V-block</u>	1
<u>Instruction example 6.2. Steel straight-edge</u>	4
<u>Instruction example 6.3. Try square</u>	7
<u>Instruction example 6.4. Centre square</u>	10
<u>Instruction example 6.5. Lathe bed</u>	13

Scraping of Plane Surfaces – Course: Technique for Manual Working of Materials. Instruction Examples for Practical Vocational Training

Institut für berufliche Entwicklung e.V.
Berlin

Original title:

Lehrbeispiele für die berufspraktische Ausbildung
“Schaben ebener Flächen”

Author. B. Zierenberg

First edition © **IBE**

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

Order No.: 90–33–3106/2

Introduction

The present material includes 5 selected instruction examples by means of which the essential operations of scraping of plane surfaces can be practised. For that purpose, rough and finish–scraping as well as pattern scraping in connection with scraping and checking against master plates of known accuracy will be practised with an increasing degree of difficulty.

In addition to the pure exercise on the V–block, the finished workpieces: steel straight–edge, try square and centre square can be used in the workshop after surface hardening; the lathe bed can only be planed at adequate local and material conditions.

In order to facilitate the preparation and execution of works, the required materials, hand tools, measuring and testing tools as well as accessories are given for each of the instruction examples. Furthermore, the previous knowledge is mentioned that is necessary for executing the exercises.

Apart from the working drawing attached, the sequence of operations has been described in a favourable order.

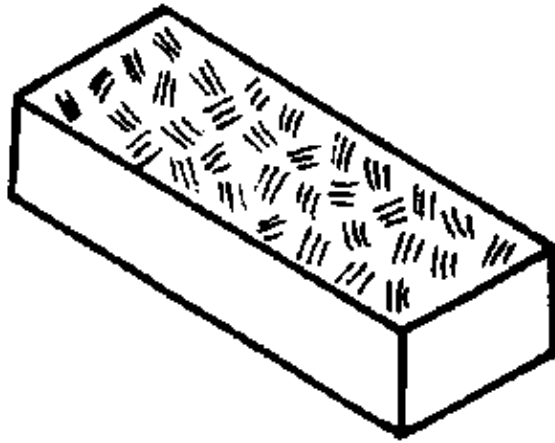
Explanation to material data:

Steel grading is as to the value of tensile strength given in the unit “Megapascal” (MPa).

Instruction example 6.1. V–block

Practise flat scraping of a flat surface without having given the size.

Material



flat material steel (600 MPa)

thickness: approx. 20 mm

width: approx. 35 mm

length: approx. 70 mm

Hand tools

Bastard file of 300 mm (flat), wide flat scraper

Measuring and testing tools

Steel rule, bevelled steel straight-edge, surface plate

Accessories

Vice, checking ink or paste, inking block

Required previous knowledge

Reading of drawings, measuring, testing, sawing, filing

Sequence of operations

Comments

1. Arrange workplace
Prepare working material

– Check for completeness

2. Check rough dimensions of workpiece; if necessary, prepare true-to-size as to drawing; rough cover surface in diagonal stroke

– (sawing, filing) roughly check surface for flatness by means of bevelled steel straightedge

3. Rough-scrape cover surface in long strokes by means of flat scraper until working marks of filing disappear

– Powerful cutting by push-scraping!

4. Rub surface plate with a wafer-thin layer of checking ink

5. Rub workpiece with the rough-scraped cover surface onto the surface plate by applying a slight pressure

– Circular moves!

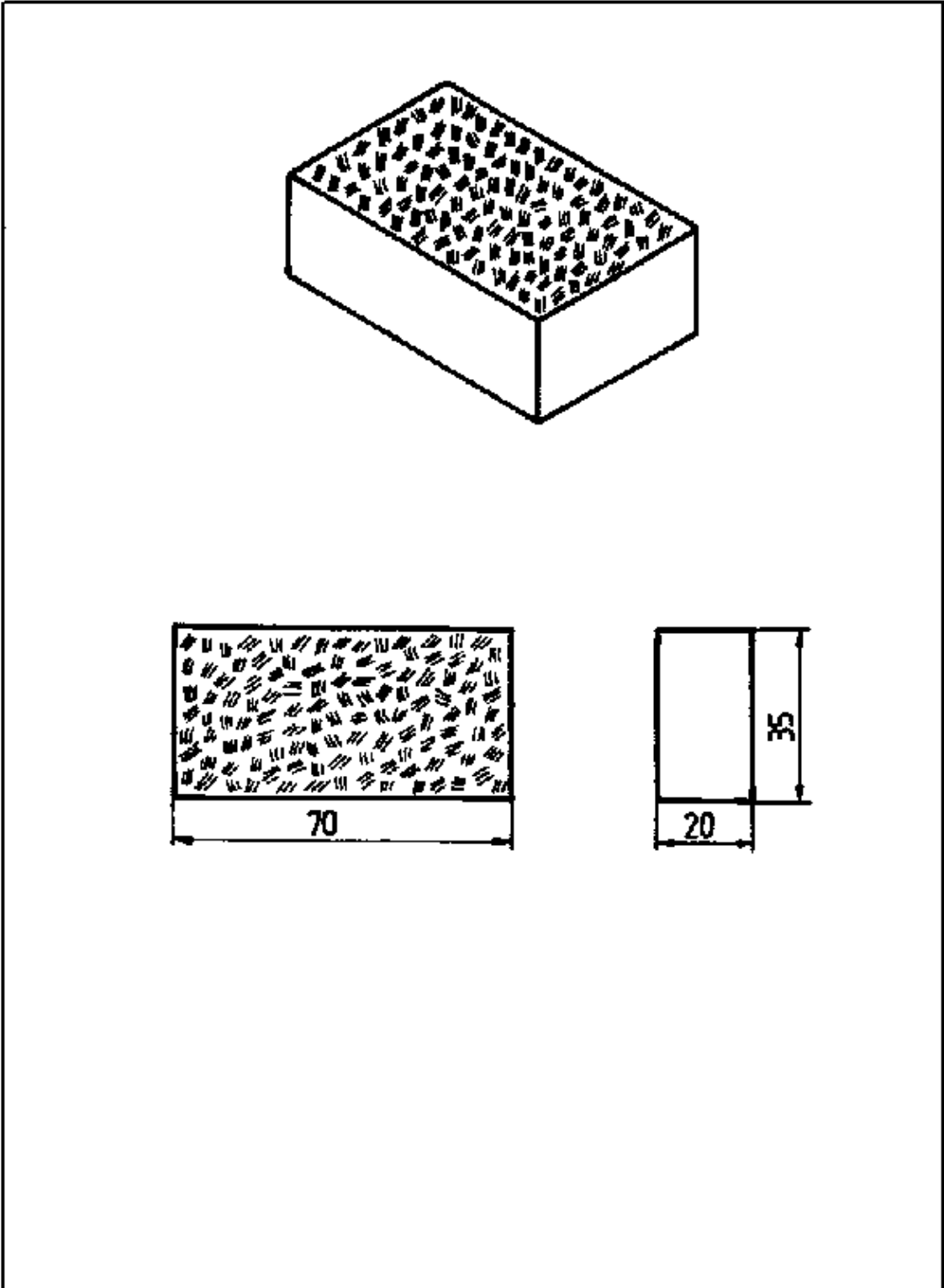
6. Take off workpiece and rough-scrape surfaces covered with checking ink
 - If there are great surface differences noticeable, the entire contact area must be scraped again in long strokes!

7. Ink and rub workpiece again, take off and check colour spots
 - When the colour spots are evenly distributed over the entire surface, begin with spot-scraping

8. Clamp workpiece and rough and spot-scrape surfaces (spots) surrounded with checking ink, change direction of stroke after each procedure of scraping
 - Work with short and slightly arched pushes by applying increasing and declining working pressure

9. Steadily change scraping and checking until the ratio between high and low areas is 3: 1

10. Final check
 - flatness, uniformity of surface appearance

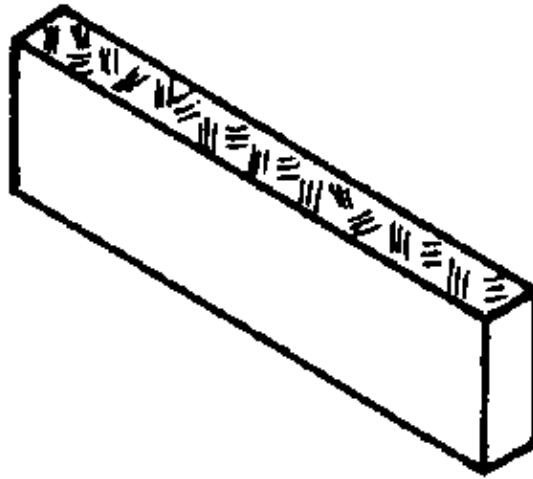


				6.1.
	V-block			3106

Instruction example 6.2. Steel straight-edge

Practise scraping of two narrow surfaces with emphasis on parallelism to each other

Material



flat material made of heat-treatable steel

thickness: 6 mm

width: approx. 35 mm

length: approx. 200 mm

Hand tools

Smooth file of 300 mm (flat), flat scraper, pull-type scraper

Measuring and testing tools

Vernier caliper, bevelled steel straight-edge, surface plate, dial gauge

Accessories

Vice, tripod for dial gauge, checking ink or paste, inking block

Required previous knowledge

Reading of drawings, measuring, testing, sawing, filing

<u>Sequence of operations</u>	<u>Comments</u>
1. Arrange workplace Prepare working material	– Check for completeness
2. Check rough dimensions of workpiece; if necessary, prepare true-to-size as to drawing	– (Sawing, filing)
3. Smooth the two longitudinal surfaces (of 6 mm width) in longitudinal stroke	– Roughly check surfaces for parallelism by means of vernier caliper
4. Rub surface plate with a wafer-thin layer of checking ink	– Circular moves!

5. Rub workpiece with a smoothed longitudinal surface onto surface plate by applying a slight pressure

6. Take off workpiece and rough and spot-scrape surfaces surrounded with checking ink

– Scrape diagonally to working marks of filing

7. Ink and rub workpiece again, check colour spots

8. Finish-scrape contact points by means of pull-type scraper

9. Work 2nd longitudinal surface repeating 5th till 8th operation, check continuously for parallelism

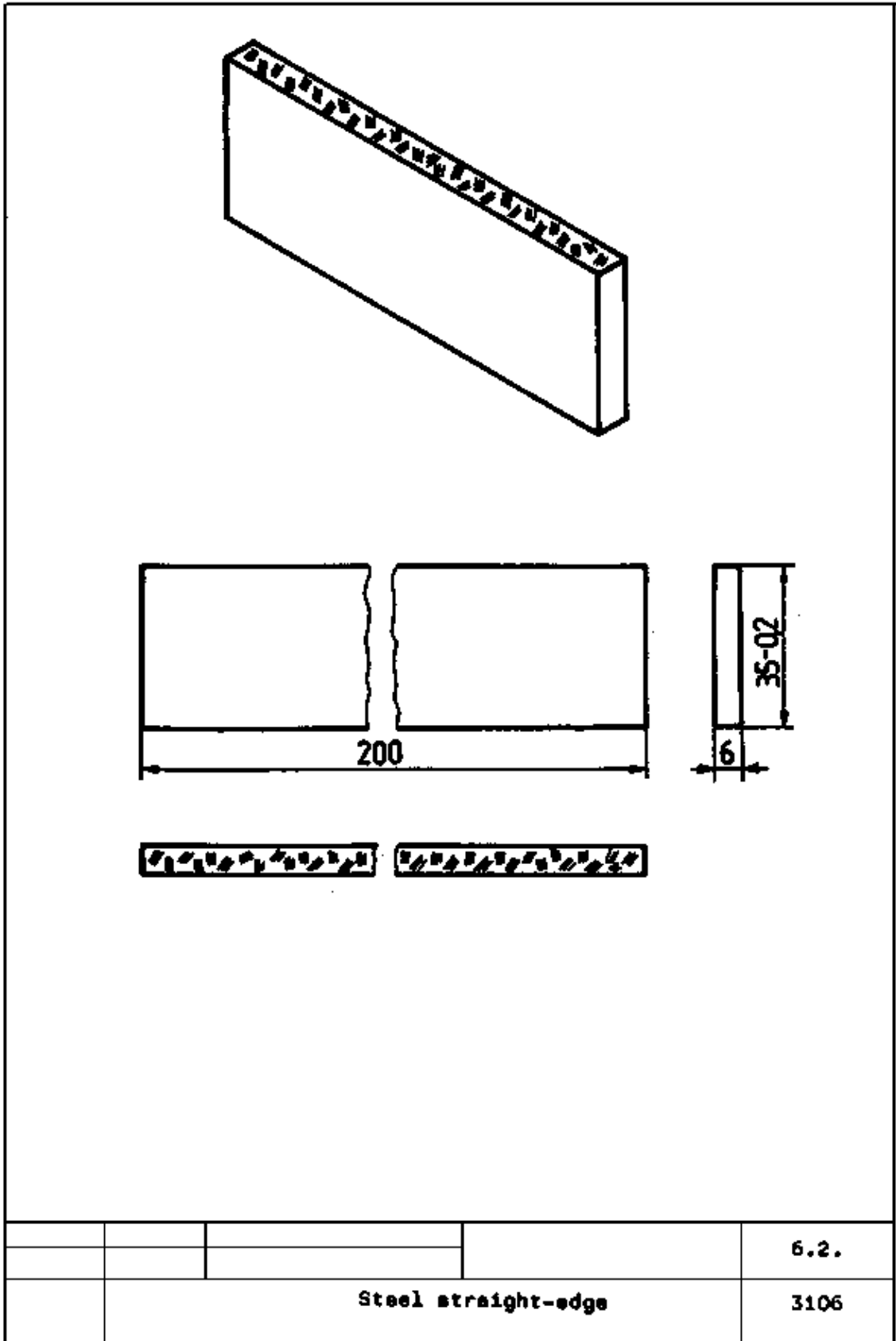
– Check parallelism by means of dial gauge

10. Final Check

– Parallelism, flatness, surface appearance

Finishing

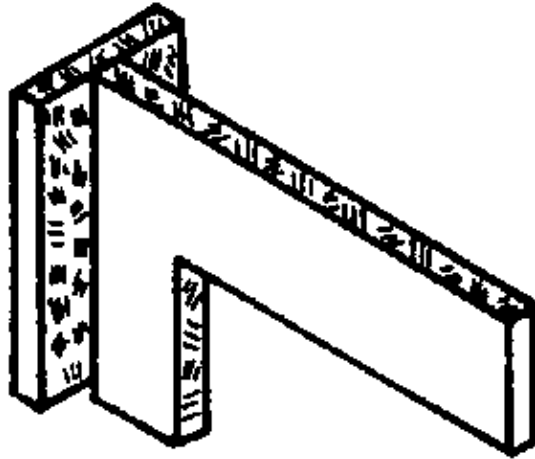
Surface hardening of functional surfaces



Instruction example 6.3. Try square

Practise scraping of two or three narrow surfaces lying in parallel to each other maintaining the specified size and parallelism.

Material



– steel sheet made of heat-treatable

steel thickness: 5 mm

width: approx. 67 mm

length: approx. 92 mm

– flat material made of heat-treatable steel

thickness: 9 mm

width: 15 mm

length: approx. 67 mm

– 2 off countersunk screws M 3 x 12

Hand tools

Hand hacksaw, surface gauge, marking-out and centre punches, locksmith's hammer, bastard and smooth files 300 mm (flat), drills of 2.5, 3.0 and 3.2 mm dia., countersink – 90°, tap M 3, screw driver, flat scraper, pull-type scraper

Measuring and testing tools

Vernier caliper with depth gauge, dial gauge, bevelled edge square, surface plate, levelling straight-edge

Accessories

Clamping tools (C-clamps and vice, machine vice), tap wrench, cutting oil, checking ink or paste, inking block, tripod for dial gauge

Required previous knowledge

Reading of drawings, measuring, testing, scribing, prick-punching, sawing, filing, drilling, countersinking, thread cutting

Sequence of operations

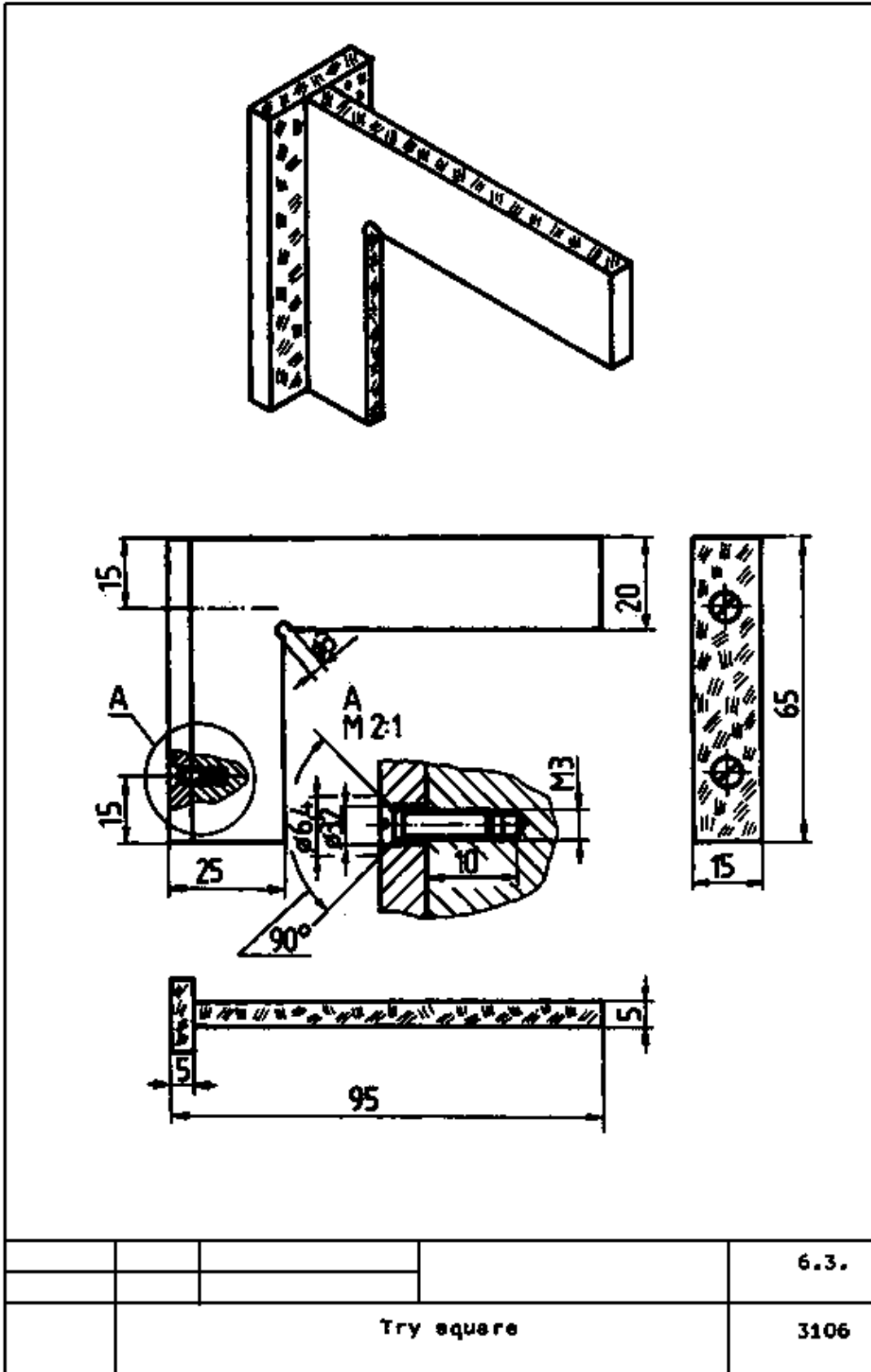
Comments

1. Arrange workplace
Prepare working material

– Check for completeness

2. Work single parts true-to-size as to drawing dimensions; smooth all surfaces; drill in clamped position; subsequently, countersink and cut thread; bolt by means of countersunk screws M 3 x 12 – (Sawing, filing)
3. Ink and check outer surface of contact face (15 x 65); subsequently, rough and spot-scrape – Use surface plate!
4. Ink and check the two inner surfaces of contact face; subsequently, rough and spot-scrape, check parallelism to outer surface – Use levelling straightedge!
Check parallelism by means of dial gauge!
5. Ink and check inner surface of short jaw; rough and spot-scrape; check parallelism to outer surface of contact face and pay attention to dimensions (25 – 0.2) – Use levelling straightedge!
6. Ink and check outer and inner surface of long jaw; rough and spot-scrape; check parallelism of both surfaces and pay attention to given dimensions (20 – 0.2)
7. Pattern-scrape all functional surfaces by means of pull-type scraper – (Stripe pattern)
8. Final check – Flatness, parallelism, appearance of pattern

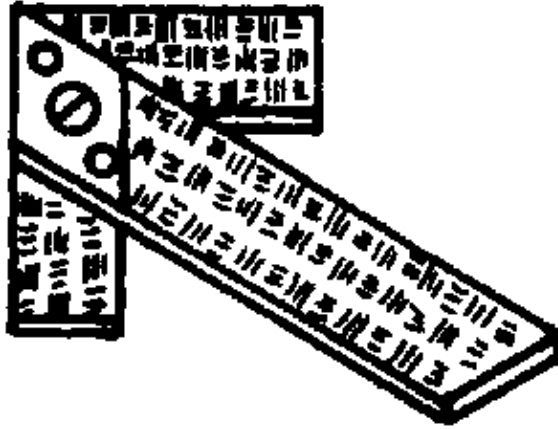
Finishing: Surface hardening of functional surfaces



Instruction example 6.4. Centre square

Practise pattern–scraping (irregular braiding pattern)

Material



– steel sheet made of heat-treatable steel

thickness: 4 mm

width: approx. 82 mm

length: approx. 82 mm

– flat material made of heat-treatable steel

thickness: 4 mm

width: 20 mm

length: approx. 162 mm

– countersunk screw M 3 x 8

– 2 off straight pins \varnothing 3m6, length: 8 mm

Hand tools

Hand hacksaw, steel scribe, marking-out and centre punches, hammer, bastard and smooth files of 250 mm (flat), drills of 2.5, 2.8, 3.2, 4.0 mm dia., hand reamer \varnothing 3 K 7, pull-type scraper, aluminium hammer, screw driver

Measuring and testing tools

Vernier caliper, bevelled edge square

Accessories

Clamping tools (C-clamps, machine vice, vice), tap wrench, cutting oil

Required previous knowledge

Reading of drawings, measuring, testing, scribing, prick-punching, sawing, filing, countersinking, thread cutting, reaming

Sequence of operations

Comments

1. Arrange workplace
Prepare working material

– Check for completeness

– (Do not drill yet)

2. Work single parts true-to-size as to given drawing dimensions; smooth all surfaces; check parallelism and angularity

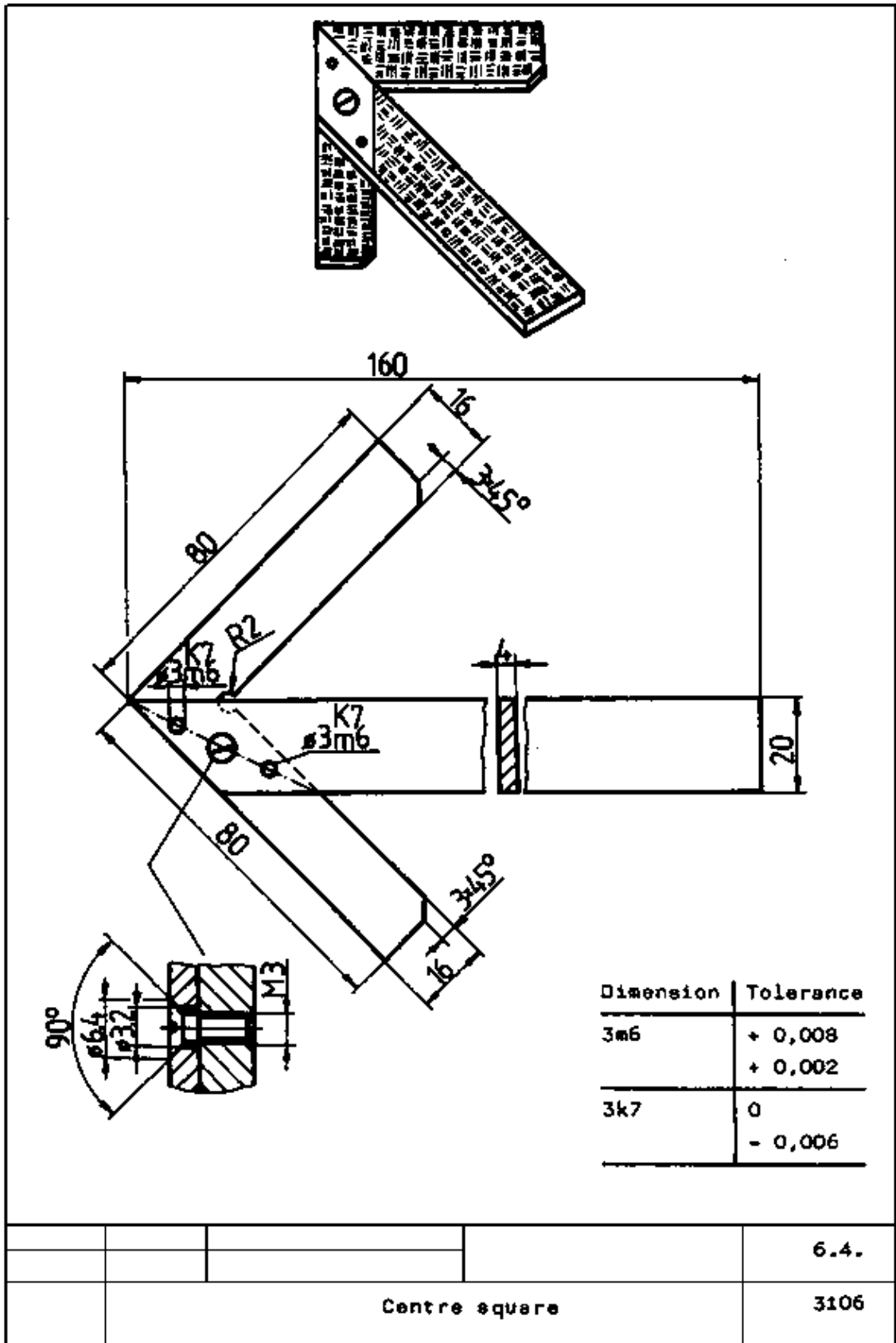
3. Scrape a braiding pattern onto both faces of the two single parts by means of pull-type scraper

4. Check

– Appearance of pattern

Finishing:

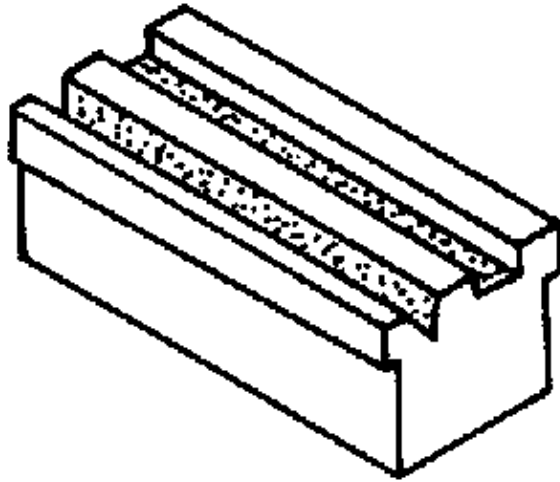
- Clamp parts and drill as to free marking, countersink and ream; after unclamping, cut thread (M 3) into the square
- Mount square (secure by screws and pins)
- Surface hardening of functional surfaces



Instruction example 6.5. Lathe bed

Practise planing of lathe bed

Material



lathe bed (base)

Hand tools

Wide and narrow flat scraper

Measuring and testing tools

Water-level (bubble level), measuring microscope, planing straight-edge, surface plate, if necessary, mating machine slide, locksmith's hammer

Accessories

Measuring bridge, long bars (lever), various steel wedges, measuring wire Ø 0.1 mm with mounting, checking ink (black, red), inking block

Required previous knowledge

Testing, measuring

<u>Sequence of operations</u>	<u>Comments</u>
1. Arrange workplace Prepare working material	– Check for completeness
2. Remove planing marks from slideway by means of wide flat scraper (powerful rough-scraping)	– Work in long powerful strokes at right angles to planing direction until planing traces disappear
3. Align lathe bed (6) by water-level (1) – place a suitable measuring bridge (2) onto lathe bed; check cross and longitudinal direction by water-level without displacing the measuring bridge; to correct position, arrange steel wedges	– Guideways must exactly lie in parallel and horizontally – Lift lathe bed by means of levers, mount steel wedges
4. Check plane ways in order to realize variations from the horizontal – mark variations at the base	– Move measuring bridge and level in longitudinal direction, measure in longitudinal and cross direction!

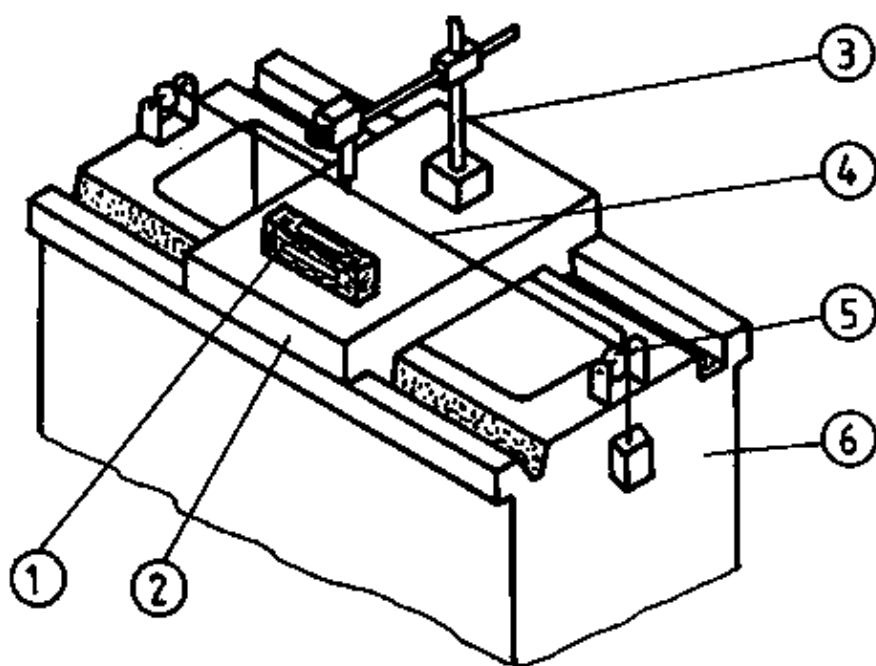
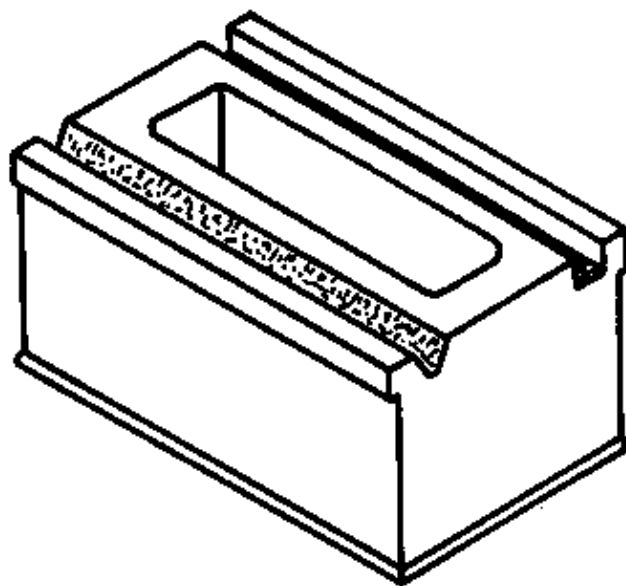
5. Check lateral bendings (variations) of guideways:
 - tension a steel wire (4) of 0.1 mm dia. along the bed centre (rigid mounting (5!))
 - mount measuring microscope (3) onto the measuring bridge and adjust to wire
 - move measuring bridge with measuring microscope along the bed – in case of variations the microscopic image is laterally displaced from wire
 - Mark variation point at the base

6. Remove measuring wire and measuring bridge, rub planing straight-edge or surface plate with a wafer-thin layer of black or red checking ink and slowly rub over the guideways (finished machine slide can also be used for checking)
 - Avoid oil blotches on guideways!

7. Take off checking device and rough-scrape the entire surface having contact points – subsequently, remove variations (found in operations No. 4 and No. 5)
 - Change scraping and checking until even contact points are reached!

8. Spot-scrape contact points in changing direction by means of narrow scraper until you can see enough contact points after checking
 - First begin with spot-scraping when you had sufficiently rough-scraped!

9. Final check
 - Function test with machine slide



				6.5.
			Lathe bed	3106