Filing – Course: Technique for Manual Working of Materials. Instruction Examples for Practical Vocational Training

Table of Contents

Filing – 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
“Feilen”

Author. B. Zierenberg

First edition © IBE

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

Order No.: 90–33–3105/2

Introduction

The present material includes 6 selected practical examples by means of which the main methods of filing can be practised. For that purpose, flat, stepped, inclined and bent surfaces and edges are worked as well as chamfers and holes are filed.

All pieces of exercise may be used in the workshop after having been finished.

Locksmith’s hammer and bevel complete the trainee’s workplace equipment; step block, sliding block and box wrench are accessories for drilling machine fixtures, the hexagon socket wrench supplements the additional workshop outfit.

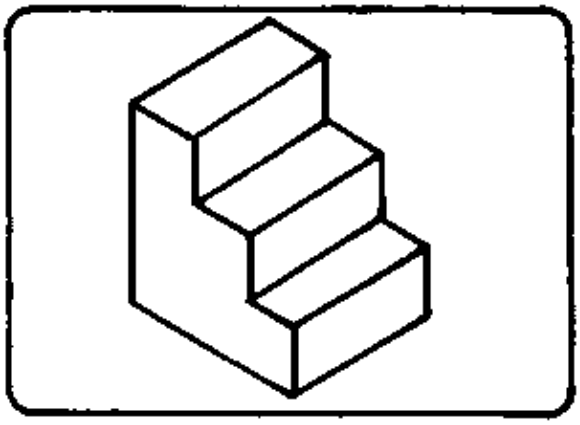
In order to facilitate the preparation and execution of work, required materials, hand tools, measuring and testing tools as well as accessories are given for each of the training examples. Furthermore, previous knowledge necessary to practise the individual exercises is specified. Pieces of exercise can be manufactured with the help of working drawings attached and respective sequences of operations.

Explanation on material designation:

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

Instruction example 5.1. – Step block

Practise filing of flat and stepped surfaces



Material

square steel	(420	MPa)
thickness:	40	mm
length:	48	mm

Hand tools

Steel scriber, scribing punch, hand hacksaw, locksmith's hammer, bastard and smooth files of 300 mm and 200 mm (flat and three–square)

Measuring and testing tools

Steel rule, vernier caliper, bevelled edge square

Accessories

Vice, surface plate, protective Jaws, saw sharpening vice

Required previous knowledge

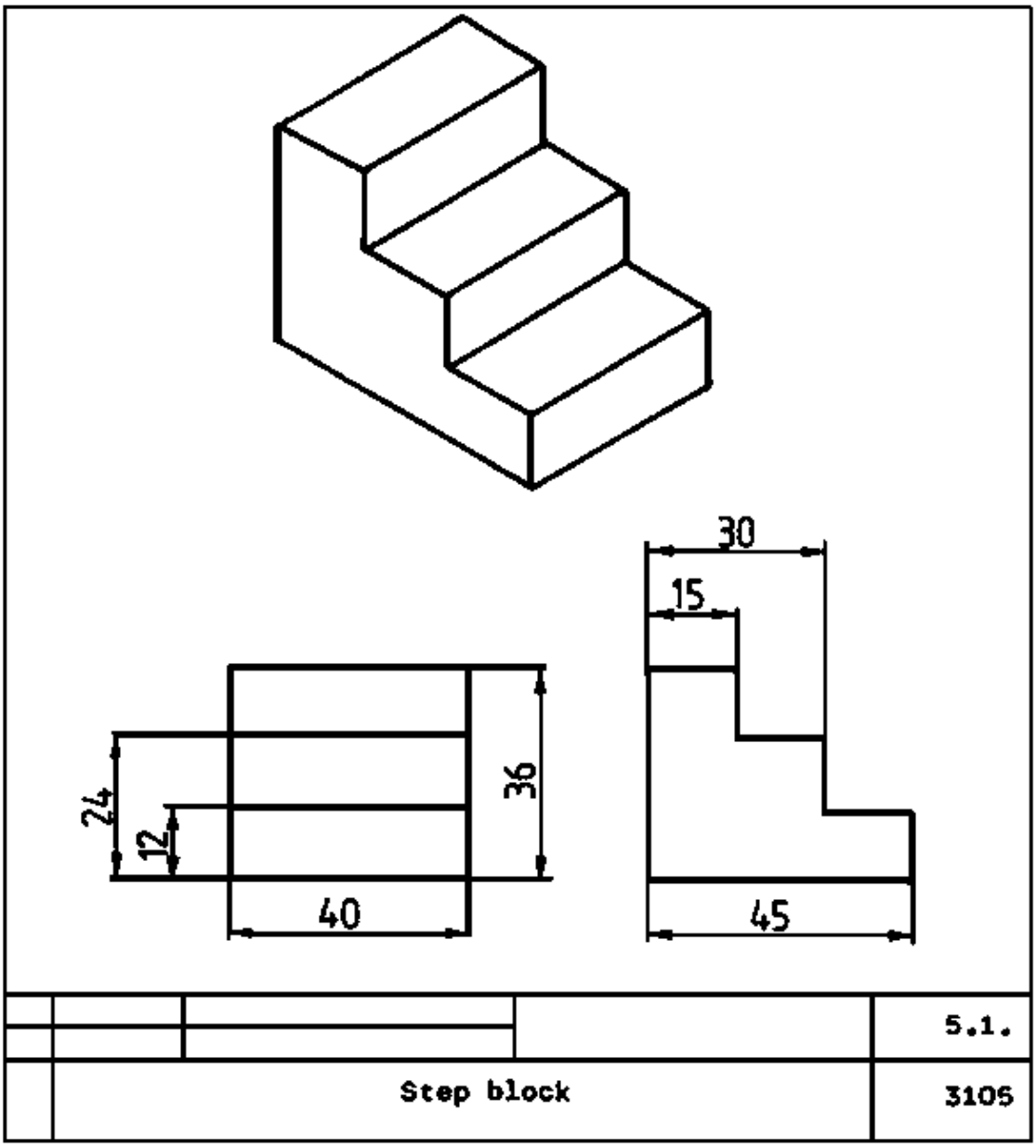
Reading of drawings, measuring, testing, scribing, prick–punching, sawing

	Sequence of operations	Comments
1.	Arrange workplace Prepare working material	– Check up completeness
2.	Check square steel length, file base flat as datum level – check	– Rough in oblique stroke – File flat in cross stroke – Smooth in longitudinal stroke
3.	File one face flat and square to base – check	– Check by means of bevelled edge square
4.	Scribe cover surface and second face starting from datum level, make control punches on the scribed line, subsequently saw	– Size allowance 0.5 to 1 mm!

5.	File sides flat and square to datum level – check	– surface – finishing quality! – Use protective jaws!
6.	Scribe steps starting from datum level, make control punches on scribed lines, subsequently saw	
7.	File horizontal surfaces (seen from base) flat and true–to–size – check	– Pay attention to control punches!
8.	File vertical surfaces flat and true–to–size – for that purpose, re–clamp work–piece – surfaces must be worked in horizontal position	– File inner edges by means of three–square files!
9.	Deburr all edges	
10.	Final control	– Surface finish, size, sqaureness

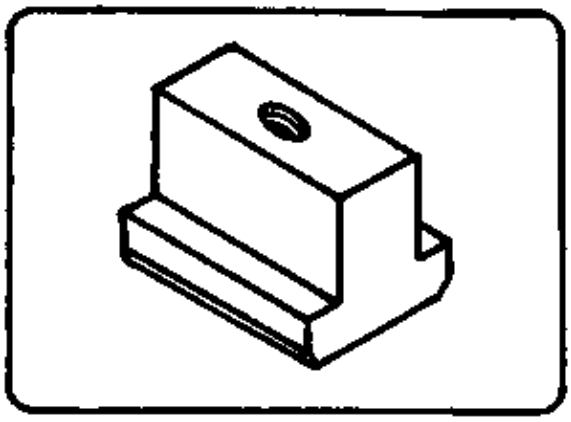
Remark

Together with the
Instruction example 2.2. (clamp),
Instruction example 5.2. (sliding block)
Instruction example 5.5. (box wrench) and
a screwed bolt M 16 with appropriate washer and nut M 16, this step block forms a complete set of clamping tools for an upright drilling machine.



Instruction example 5.2. – Sliding block

Practise filing of flat and stepped surfaces as well as chamfers paying attention to squareness and accuracy to size



Material

square steel	(600	MPa)
thickness:	36	mm
length:	32	mm

Hand tools

Steel scriber, scribing punch, hand hacksaw, locksmith's hammer, bastard and smooth files of 250 mm (flat and three–square)

Measuring and testing tools

Steel rule, vernier caliper, bevelled edge square

Accessories

Vice, surface plate, protective jaws

Required previous knowledge

Reading of drawings, measuring, testing, scribing, prick–punching, sawing

	Sequence of operations	Comments
1.	Arrange workplace Prepare working material	– Check up completeness
2.	Check up square steel length, file base flat as datum level – check	– Rough in oblique stroke – File flat in cross stroke – Smooth in longitudinal stroke
3.	File one face flat and square to base – check	
4.	Scribe cover surface and second face starting from datum levels, make control punches on scribed line – subsequently file	– Apply protective jaws – Surface Finishing quality!
5.	Scribe and punch steps starting from datum levels; subsequently saw and file – check	– Pay attention to squareness
6.	File chamfers	– Clamp workpiece in saw sharpening vice
7.	Deburr all edges	

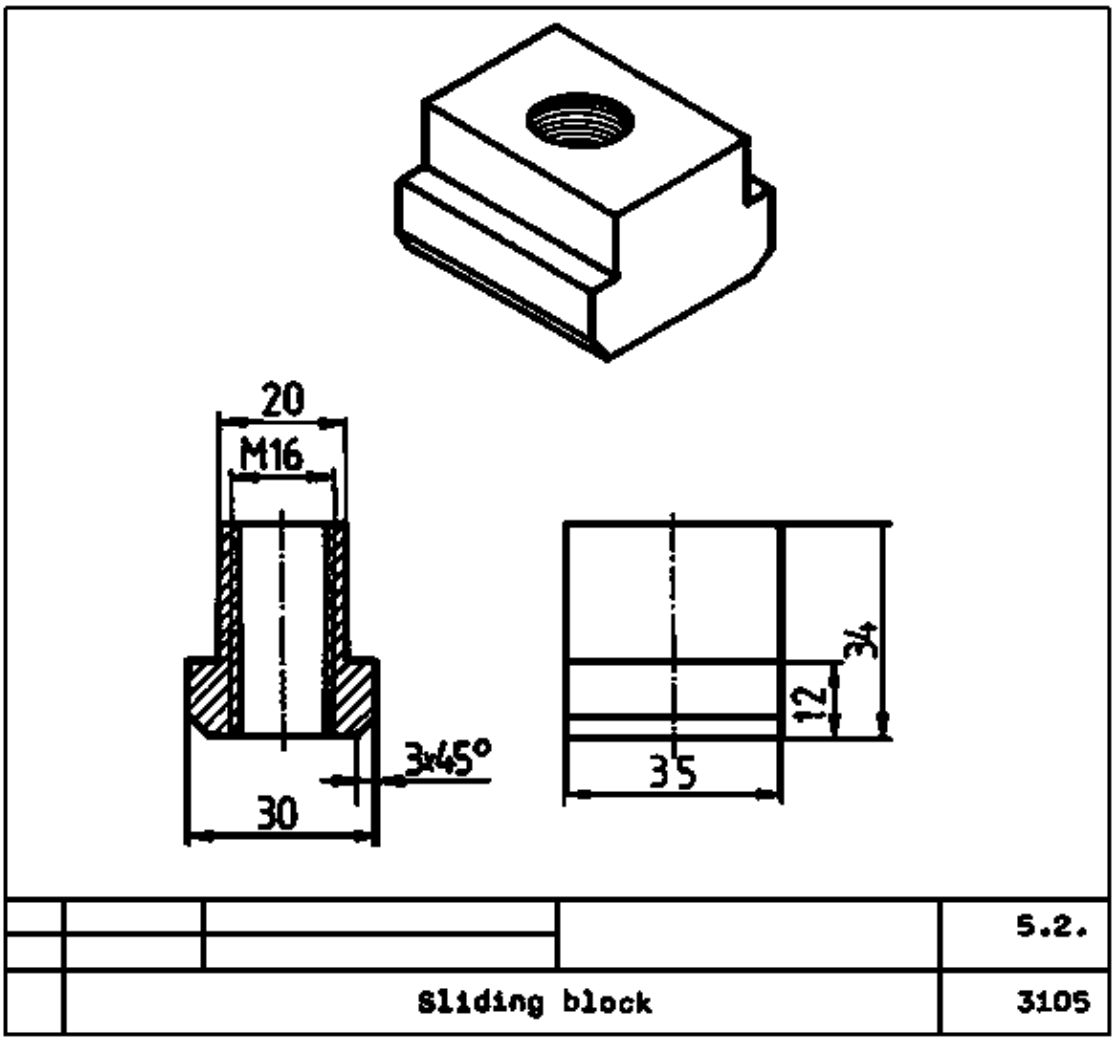
8. Final control – Surface finish, size, squareness

Finishing

Make tapped bore M 16 according to drawing.

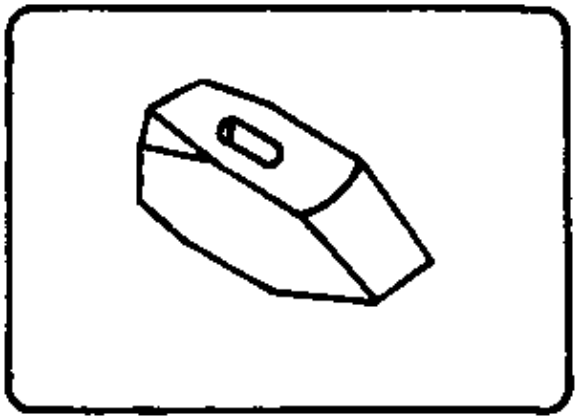
Remark

Together with the
instruction example 2.2. (clamp),
instruction example 5.1. (step block),
instruction example 5.5. (box wrench) and
a screwed bolt M 16 with appropriate washer and nut M 16, this sliding block forms a complete set of clamping tools for an upright drilling machine.



Instruction example 5.3. – Locksmith's hammer

Practise filing of flat and inclined surfaces, radii as well as holes and chamfers



Material

square material made of cold forming steel (carbon content 2 to 2.2%)

thickness: 24 mm

length: 108 mm

Hand tools

Hand hacksaw, steel scriber, scribing punch, hammer, drill of 10 mm dia., bastard and smooth files of 300 mm (flat), bastard file of 200 mm (round)

Measuring and testing tools

Steel rule, vernier caliper, bevel protractor, 3 mm radius gauge

Accessories

Vice, surface plate, protective Jaws, saw sharpening vice, lubricant and coolant (diluted soluble oil), machine vice

Required previous knowledge

Reading of drawings, measuring, testing, scribing, prick–punching, sawing, drilling

Sequence of operations	Comments
1. Arrange workplace Prepare working material	– Check up completeness
2. File sides flat	– Do not smooth yet!
3. Scribe and punch hammer peen; subsequently saw and file – check	
4. File top and base as well as face – check	
5. File chamfers and camber on hammer face as well as radius on hammer peen	– Use saw sharpening vice

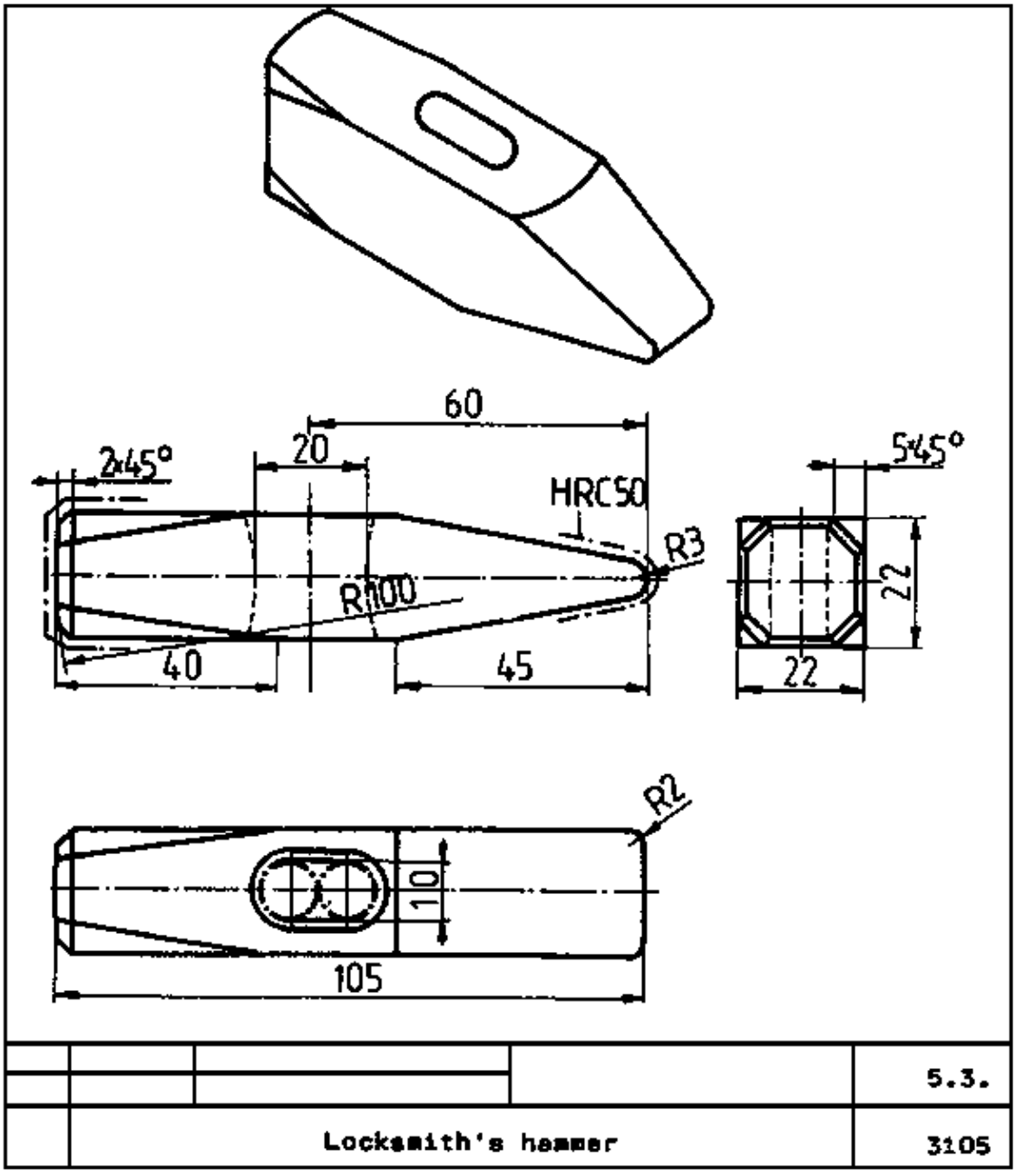
6. Drill hole, file hole with reciprocating movement – conical
   – Drill of 10 mm dia.
   – Drill under direction of instructor!

7. Smooth and deburr all surfaces

8. Final control
   – Surfaces,
   – Accuracy to size,
   – Flatness and angularity of surfaces

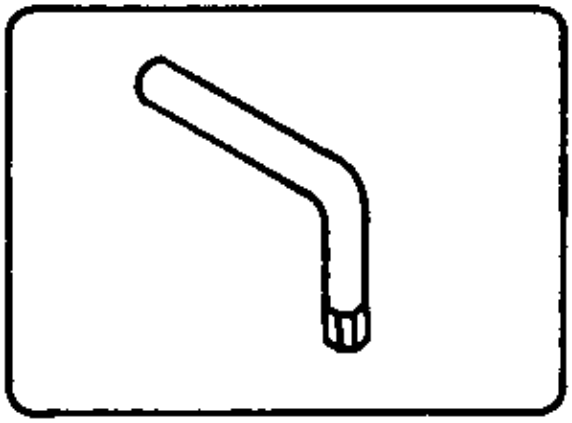
Finishing

Hardening of face and hammer peen to HRC 50, fit hammer handle, drive in key



Instruction example 5.4. – Hexagon socket wrench

Practise filing of small stepped surfaces In compliance with accuracy to size and angularity as well as of filing of a chamfer on round material



Material

round material made of cold forming steel (carbon content 2 to 2.2%*)*

diameter: 6 mm

length: approx. 120 mm

Hand tools

Hand hacksaw, steel scriber, warding file of 100 mm (flat)

Measuring and testing tools

Steel rule, vernier caliper, try square

Accessories

Vice, jaws for round material, Vees

Required previous knowledge

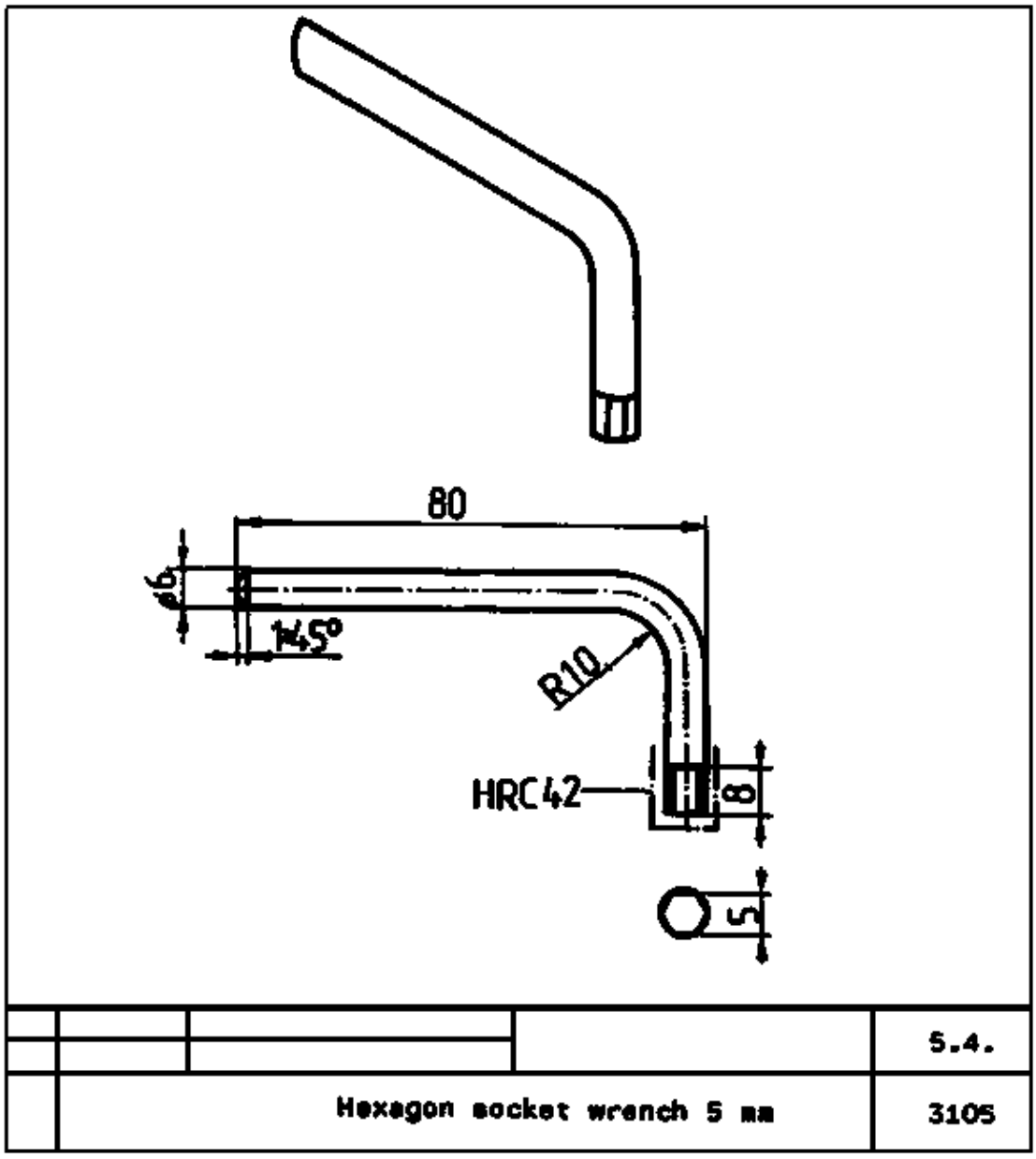
Reading of drawings, measuring, testing, scribing, sawing

	Sequence of operations	Comments
1.	Arrange workplace Prepare working material	– Check up completeness
2.	Clamp round materials into jaws, face–file one face and make a chamfer	– Swing file around the round material!
3.	Face–file the other face and scribe hexagon	
4.	Clamp round material horizontally into Vees and file hexagon step by step	– File opposite surfaces in parallel!

5. Final control – Accuracy to size
– Surfaces

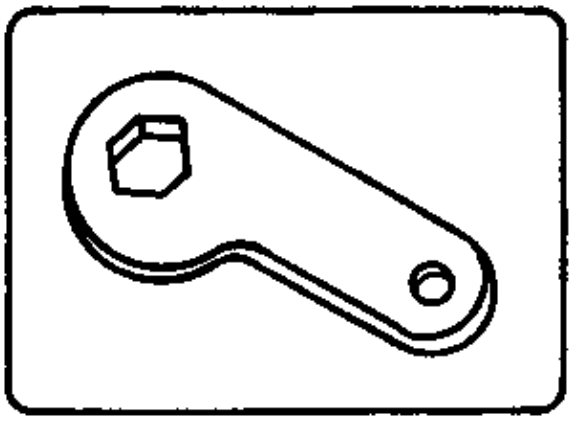
Finishing

Bend round material according to drawing; subsequently, get hexagon hardened to HRC 42.



Instruction example 5.5. – Box wrench 24 mm

Practise filing of flat and bent surfaces



Material

steel sheet made of cold forming steel (carbon content 2 to 2.2%*)*

thickness:	8	mm
width:	42	mm
length:	182	mm

Hand tools

Hand hacksaw, steel scriber, beam trammels, scribing punch, locksmith's hammer, drills of 6 and 22 mm dia., bastard and smooth files of 250 mm (flat and half round), warding file of 100 mm (flat)

Measuring and testing tools

Vernier caliper, radius gauge of 10 and 20 mm

Accessories

Vice, protective jaws, saw sharpening vice, lubricant and coolant (diluted soluble oil), machine vice

Required previous knowledge

Reading of drawings, measuring, testing, scribing, prick–punching, sawing, drilling

Sequence of operations	Comments
1. Arrange workplace Prepare working material	– Check up completeness
2. Scribe and punch steel sheet completely	– Start from datum lines!
3. Make the two bores	– Caution! Pay special attention to firm clamping of bore of 22 mm dia.
4. File hole of 24 mm	

5. Saw external outline, file to size and shape

6. Smooth all surfaces, chamfer all outer edges – Use saw sharpening vice!

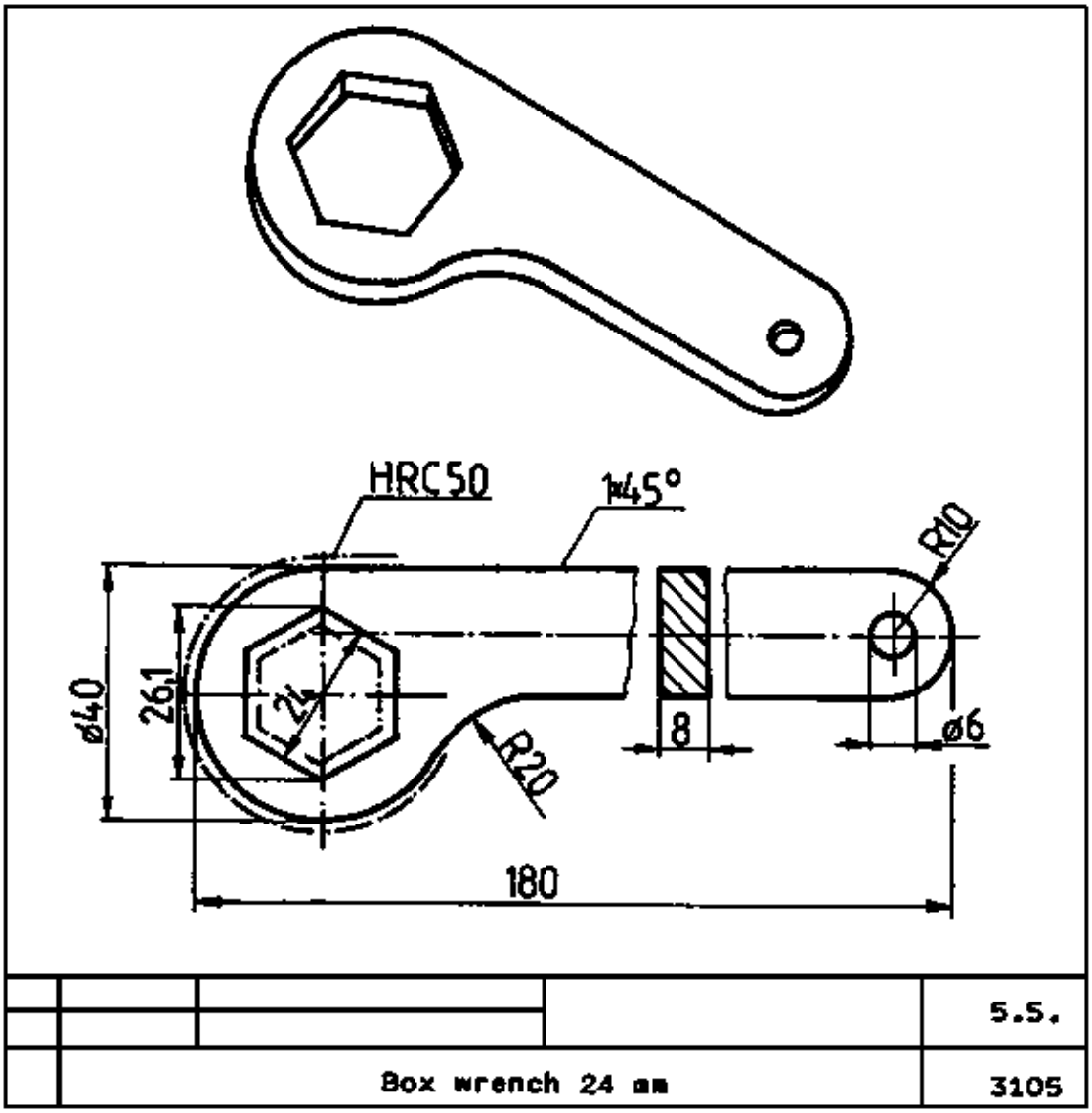
7. Final control – Accuracy to size, surfaces

Finishing

Hardening of box end to HRC 50

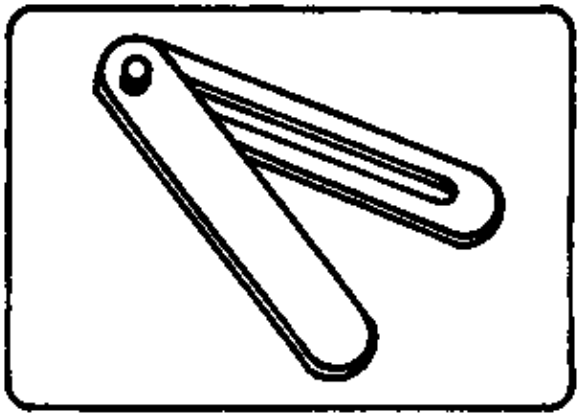
Remark

Together with the instruction example 2.2. (clamp), instruction example 5.1. (step block), instruction example 5.2. (sliding block) and a screwed bolt M 16 with appropriate washer and nut M 16, this box wrench forms a complete set of clamping tools for an upright drilling machine,



Instruction example 5.6. – Bevel

Practise filing of flat and bent surfaces as well as of a long hole according to size specified



Material

– 2x flat material made of high–strength steel (600 MPa)

thickness:	6	mm
width:	30	mm
length:	302	mm

– high straight–knurled screw M 6

– straight–knurled nut M 6

Hand tools

Hand hacksaw, steel scriber, scribing and centre punch, locksmith's hammer, cutting–off mortiser, drills of 11.8 and 12 mm, bastard and smooth files of 240 mm (flat)

Measuring and testing tools

Steel rule, vernier caliper, radius gauge 14 mm

Accessories

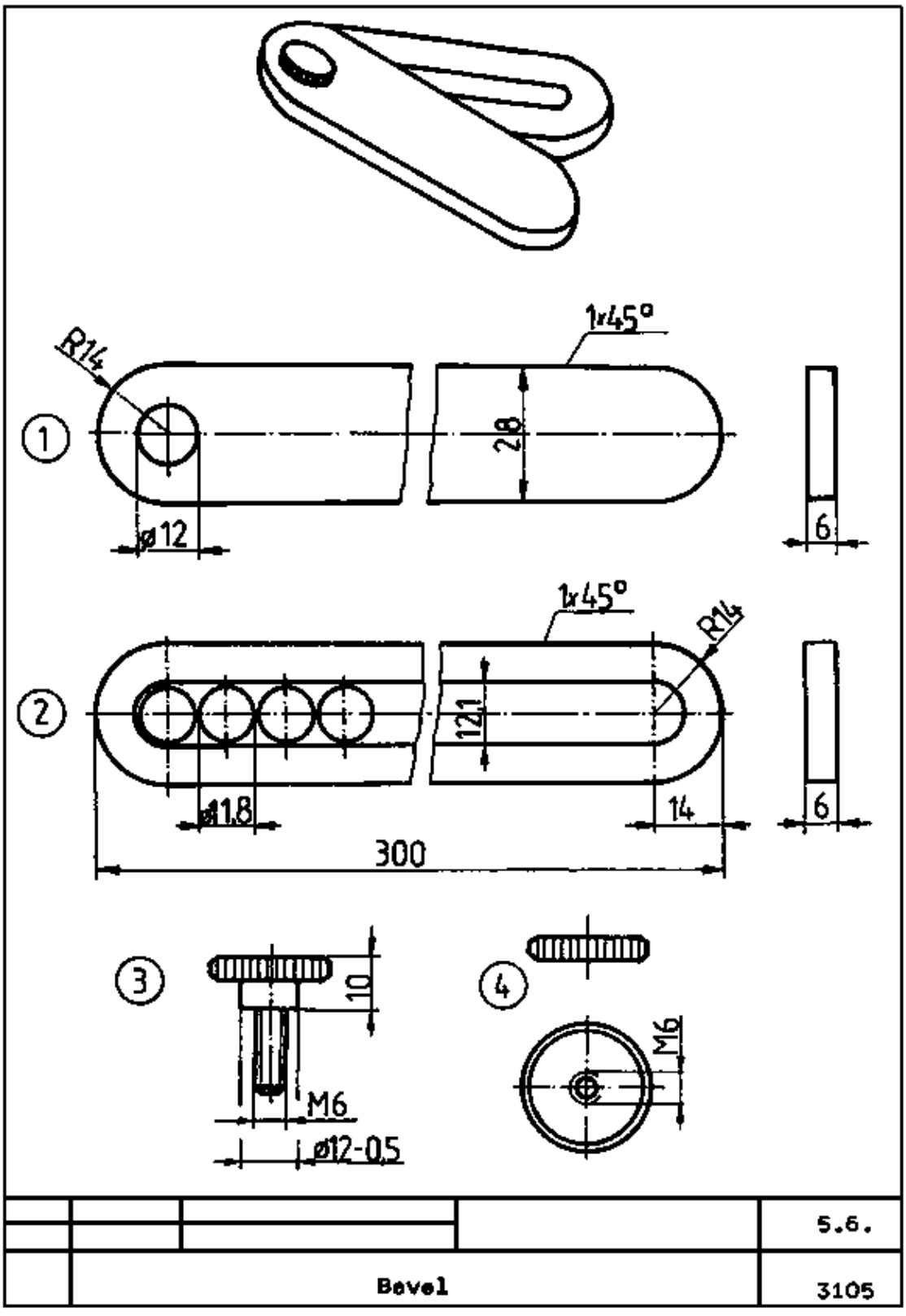
Vice, saw sharpening vice, surface plate, machine vice, lubricant and coolant (diluted soluble oil)

Required previous knowledge

Reading of drawings, measuring, testing, scribing, prick–punching, sawing, drilling, chiselling

	Sequence of operations	Comments
1.	Arrange workplace Prepare working material	– Check up completeness
2.	Produce a cent re line on both flat materials, scribe external outline starting from centre line, punch radii	
3.	Scribe and punch bores	– Prick–punch through–hole bores in a distance of 12 mm!

4.	Drill part (1) by drill of 12 mm dia., drill part (2) by drill of 11.8 mm dia.	– Secure workplaces against pulling up and turning round!
5.	Calk hole of part (2) by means of cutting–off mortiser and file to size 12.1 mm	– Constant edge line – no steps!
6.	File outer edges and surfaces of part (1) and part (2); chamfer all edges with 1 x 45°	– Surface; Finishing quality – Use saw sharpening vice
7.	Check up surfaces and edges for evenness and finishing quality	
8.	Mount parts (1) and (2) by parts (3) and (4)	
9.	Final control	– Accuracy to size, appearance, good movability of part (2)



				5.6.
	Bevel			3105