

**Keyed Joints – Course: Techniques of Fitting and Assembling
Component Parts to Produce Simple Units. Instruction Examples for
Practical Vocational Training**

Table of Contents

<u>Keyed Joints – Course: Techniques of Fitting and Assembling Component Parts to Produce Simple Units. Instruction Examples for Practical Vocational Training</u>	1
<u>Preliminary Remarks</u>	1
<u>Instruction Example 35.1. Tapered Driving Key Joints</u>	1
<u>Instruction Example 35.2. Laid-in Key Joint</u>	4
<u>Instruction Example 35.3. Tangential Key Joint</u>	7
<u>Instruction Example 35.4. Cotter Joint</u>	10

Keyed Joints – Course: Techniques of Fitting and Assembling Component Parts to Produce Simple Units. Instruction Examples for Practical Vocational Training

**Institut für berufliche Entwicklung e.V.
Berlin**

Original title:
Lehrbeispiele für die berufspraktische Ausbildung
“Keilverbindungen”

Author: Frank Wenghöfer

First edition © **IBE**

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

Order No.: 90–33–3135/2

Preliminary Remarks

The present material gives 4 selected instruction examples, by which the making of different types of keyed joints can be practised.

In these examples, drive-fitted keys, sunk keys, tangential keys and cotters are used.

Since keyed joints are made in various ways according to the respective function of the machine parts, simple pieces for exercise were chosen for practising the assembly and disassembly of the connections.

The material for the exercises must be prepared mechanically by turning, milling, shaping and reaming. In doing so, the given fitting sizes must be observed.

The keys are taken from standardized ranges or are to be premanufactured according to the given dimensions.

The prefabrication of the starting material is not described in this material.

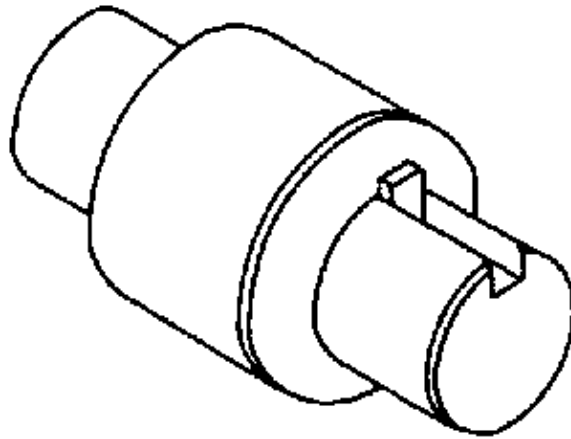
In order to facilitate the preparation and carrying out of the exercises, the required materials, tools, devices, measuring and testing means as well as auxiliary accessories are indicated for each instruction example. Furthermore, the previous knowledge required for the accomplishment of the exercises is mentioned.

With the help of the working drawings and the appertaining sequences of operations the exercises can be independently be done by the trainees.

Instruction Example 35.1. Tapered Driving Key Joints

Practising the making of a keyed joint using a drive-fitted key.

Material



Component parts of steel (420 MPa) premanufactured according to the working drawing:

- Shaft (1)
 - Diameter 50 h 6
 - Length: 150 mm approx.
- Hub (2)
 - Diameter: 70 mm
 - Length: 65 mm
- Drive-fitted key (3)
 - Height: 8.7 mm
 - Width: 14 h 9
 - Length: 70 mm

Tools

Finishing file 200 mm (half-round), triangular scraper, locksmith’s hammer, hand hacksaw.

Measuring and testing means

Vernier caliper, plug limit gauge \varnothing 50 H 7, external limit gauge \varnothing 50 h 6, dial gauge with tripod and holding device for shaft.

Auxiliary accessories

Vice with soft-metal protective jaws, machine grease, cotter driver.

Necessary previous knowledge

Measuring, testing, fundamentals of fitting.

Sequence of operations

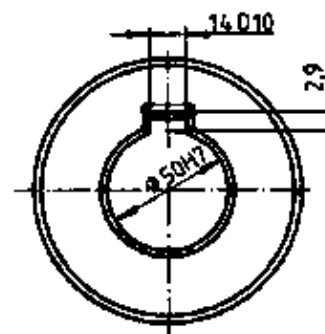
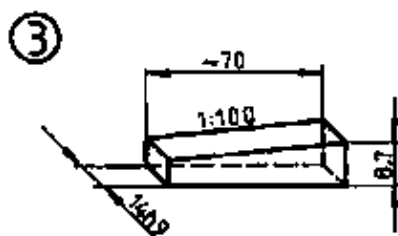
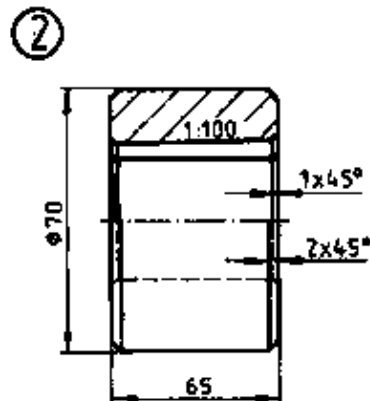
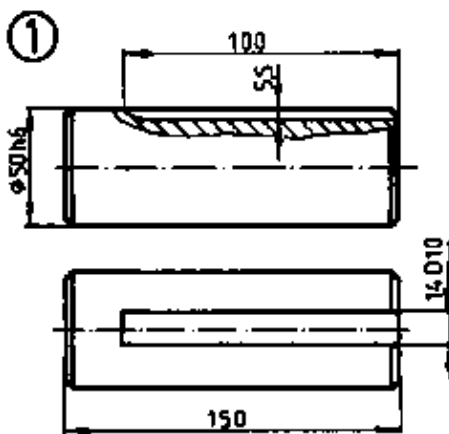
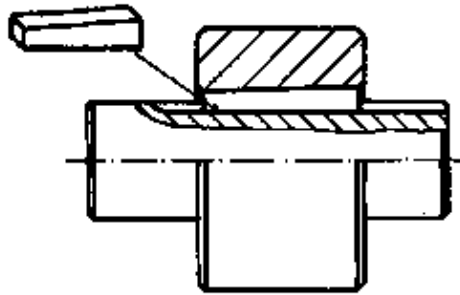
Comments

1. Preparing the workplace.
Making the working material available.

Checking for completeness.

2. Checking the individual parts for accuracy of size and burr; deburring, if necessary.	<ul style="list-style-type: none"> - Shaft (1) - Hub (2) - Drive-fitted key (3)
3. Putting the key in the keyways of the assembled parts by way of trial.	Finding out the bearing contact pattern on the back surface, reworking the surfaces to fit.
4. Sawing the tapered driving key to final length (approximately 63 mm).	Tapered driving key must not project from the side of the hub.
5. Greasing the shaft and the hub slightly and reassembling them.	
6. Putting in a slightly greased tapered driving key and fixing it with the help of hammer and cotter driver.	Clamp the component parts firmly in the vice!
7. Testing the joint.	<ul style="list-style-type: none"> - Firm fit of the hub. - Exact fitting of the tapered driving key. - True running.
8. Undoing the joint, dismantling of hub and shaft.	Driving out the tapered driving key in opposite direction by cotter driver.

14h9	0 -0,043
14D10	+0,120 +0,050
50h6	0 -0,016
50H7	+0,025 0

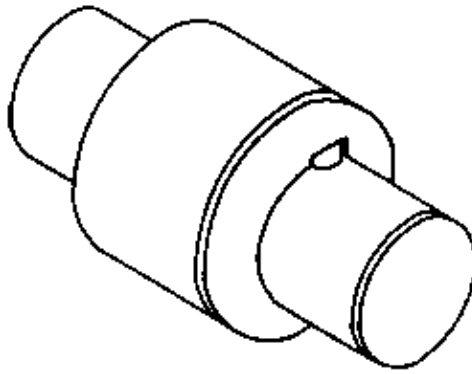


			35.1.
IBE	Tapered Driving		3135

Instruction Example 35.2. Laid-in Key Joint

Making a keyed joint by using a laid-in key.

Material



Individual parts of 420 MPa steel premanufactured according to the working drawing:

- Shaft (1)
 - Diameter: 50 h 6
 - Length: 150 mm, approx.
- Hub (2)
 - Diameter: 70 mm
 - Length: 65 mm
- Sunk key (3)
 - Height: 8.7 mm
 - Width: 14 h 9
 - Length: 63 mm

Tools

Finishing file 200 mm, half-round; triangular scraper, hand screw press with hollow die and support.

Measuring and testing means

Vernier caliper, plug limit gauge $\varnothing 50 H 7$, external limit gauge $\varnothing 50 h 6$, dial gauge with tripod and holding device for shaft.

Auxiliary accessories

Vice with soft-metal protective jaws, machine grease.

Necessary previous knowledge

Measuring, testing, fundamentals of fitting.

Sequence of operations

Comments

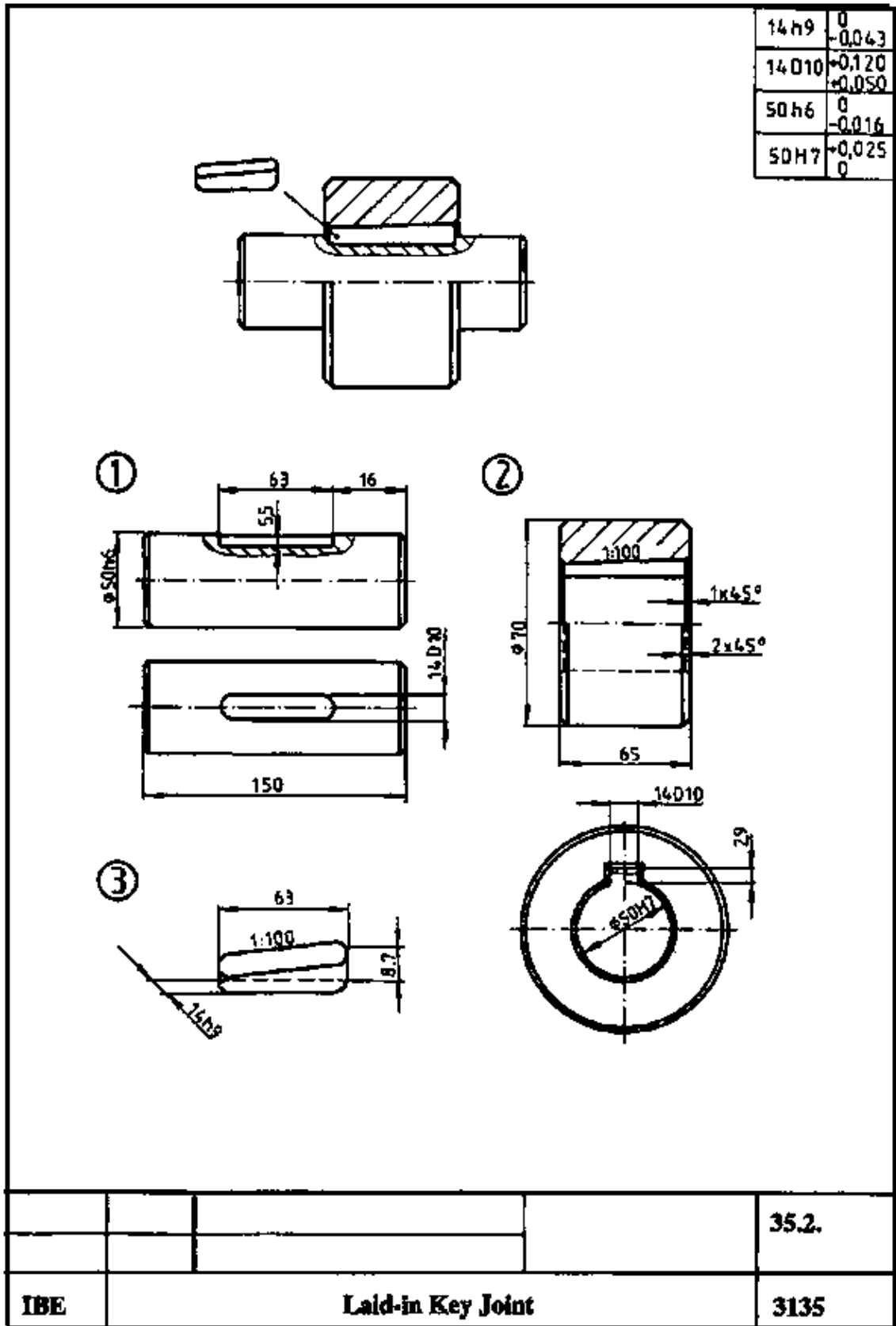
1. Preparing the workplace.
Making the working materials available.

Checking for completeness.

2. Checking the individual parts for accuracy of size and bun; deburring, if necessary.

– Shaft (1)
– Hub (2)
– Laid-in key (3)

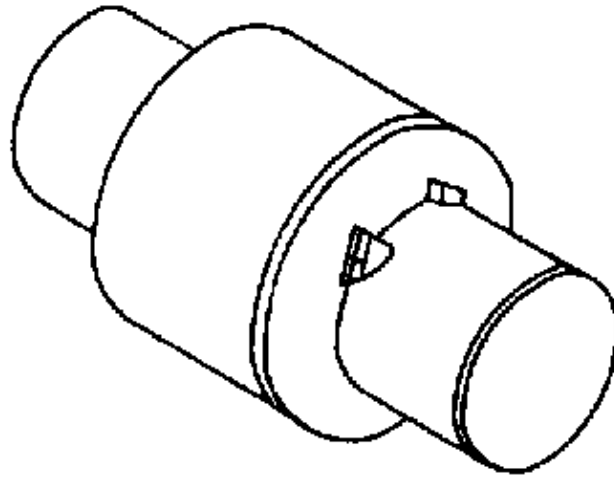
- | | |
|---|--|
| 3. Pitting the laid-in key in the hub keyway. | Key must be easy to put in. |
| 4. Putting together (on trial) of shaft and hub over the key. | Finding out the bearing contact pattern of the back surface, reworking the surface to fit. |
| 5. Greasing shaft and hub slightly and putting them together again. | Pressing the elements together by using hand screw press. |
| 6. Testing the connection. | <ul style="list-style-type: none">- Firm fit of hub- True running |
| 7. Dismantling of hub and shaft, taking the laid-in key out. | Forcing the elements apart by means of hand screw press. |



Instruction Example 35.3. Tangential Key Joint

Making a keyed joint by using tangential keys.

Material



Steel parts from 420 MPa steel, premanufactured according to working drawing:

- Shaft (1)
 - Diameter: 50 h 6
 - Length: 150 mm
- Hub (2)
 - Diameter 70 mm
 - Length: 75 mm
- 2 pairs of tangential keys (3)
 - Height: 6 mm
 - Width: 9 mm
 - Length: 90 mm

Tools

Finishing file 200 mm, half-round; triangular scraper, hand hacksaw, locksmith's and light-metal hammers.

Measuring and testing means

Vernier caliper, plug limit gauge \varnothing 50 h 7, external limit gauge \varnothing 50 h 6, dial gauge with tripod and holding device for shaft.

Auxiliary accessories

Vice with soft-metal protective jaws, machine grease, cotter driver or non-ferrous metal arbor.

Necessary previous knowledge

Measuring, testing, fundamentals of fitting.

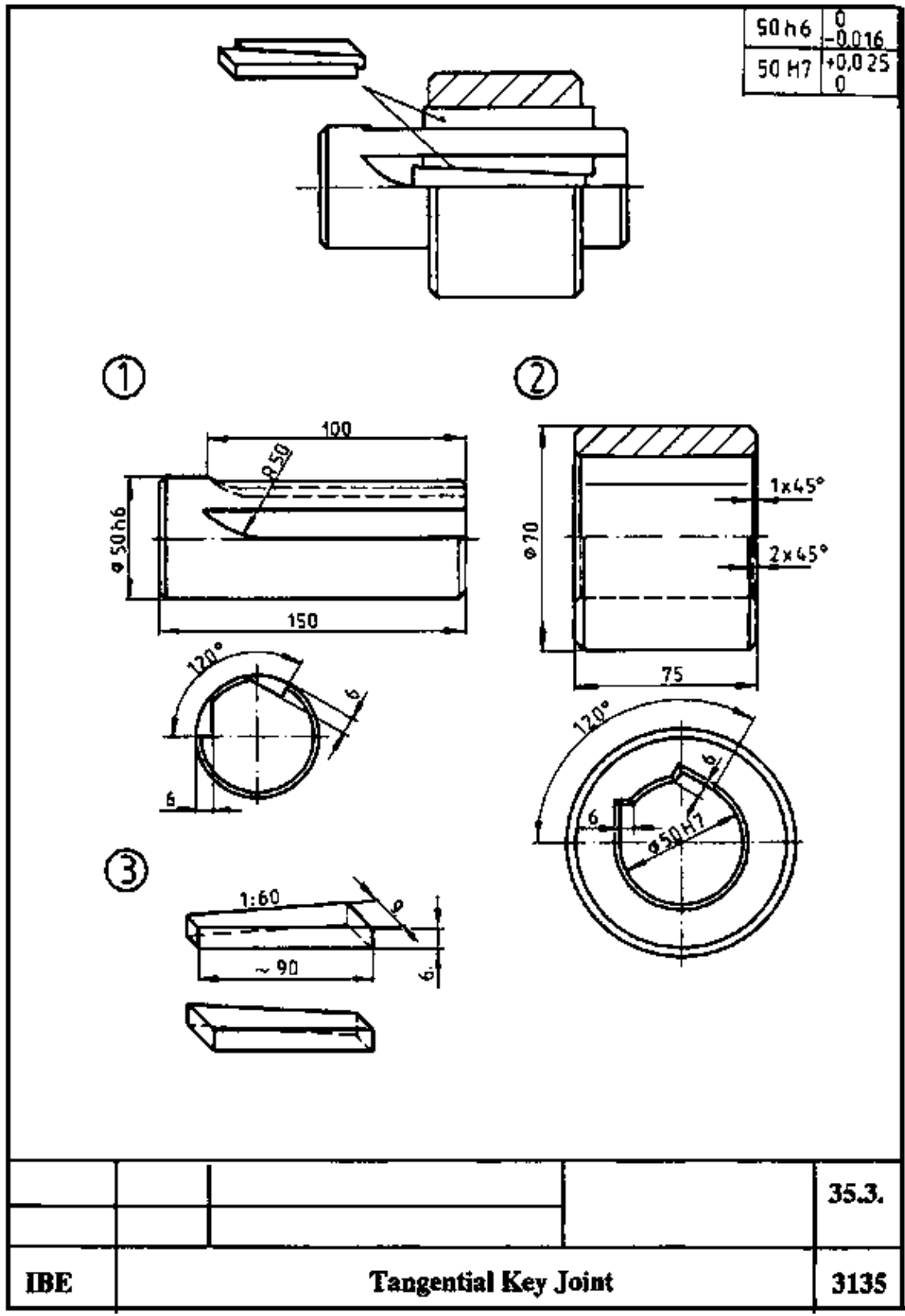
Sequence of operations

Comments

1. Preparing the workplace.
Making the working material available.

Checking for completeness.

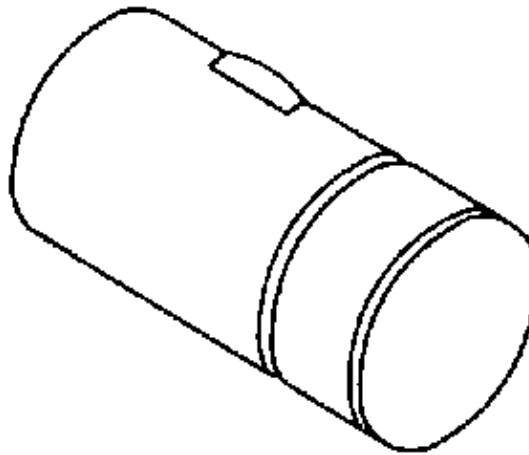
- | | |
|---|--|
| 2. Checking the individual parts for accuracy of size and bun; deburring, if necessary. | <ul style="list-style-type: none"> – Shaft (1) – Hub (2) – 2 pairs of tangential keys (3) |
| 3. Putting the keys in the keyways of the assembled parts (on trial); putting one key in each keyway first, then driving in the other keys alternately. | Finding out the bearing contact pattern of the back surfaces and reworking them to fit. |
| 4. Sawing the keys to their final length – approximately 80 mm | Keys are allowed to project from the hub laterally by maximally 2 mm. |
| 5. Slightly greasing shaft and hub separately and putting them together again. | |
| 6. Putting in the slightly greased tangential keys and fixing them alternately with hammer and cotter driver. | Clamp the component parts firmly in the vice! |
| 7. Testing the joint. | <ul style="list-style-type: none"> – Firm fit of the hub – Accurate fit of the tangential keys – True running |
| 8. Undoing the connection, disassembling of hub and shaft. | Driving out the keys with cotter driver. |



Instruction Example 35.4. Cotter Joint

Making a keyed joint by using a cotter.

Material



Premanufactured 420 MPa steel parts, premanufactured according to the working drawing:

- Sleeve (1)
 - Diameter: 50 mm
 - Length: 150 mm
- Core (2)
 - Diameter: 50 mm
 - Length: 110 mm
- Cotter (3)
 - Height: 20.5 mm
 - Width: 6 mm
 - Length: 60 mm

Tools

Finishing file 200 mm, half-round; triangular scraper; locksmith's and light-metal hammers; hand hacksaw

Measuring and testing means

Vernier caliper

Auxiliary accessories

Vice with soft-metal protective jaws, machine grease, non ferrous metal arbor

Necessary previous knowledge

Measuring, testing, fundamentals of fitting

<u>Sequence of operations</u>	<u>Comments</u>
1. Preparing the workplace Making the working material available.	Checking of completeness.
2. Checking the individual parts for accuracy of size and burr; deburring, if necessary.	– Sleeve (1) – Core (2) – Cotter (3)

3. Putting the key in the oblong hole of the aligned and assembled parts (on trial).

Finding out the bearing contact pattern, reworking the surface to fit.

4. Sawing the cotter to its final length and chamfering its head by filing.

5. Putting the slightly greased cotter in the oblong hole and fixing it by hammer blows.

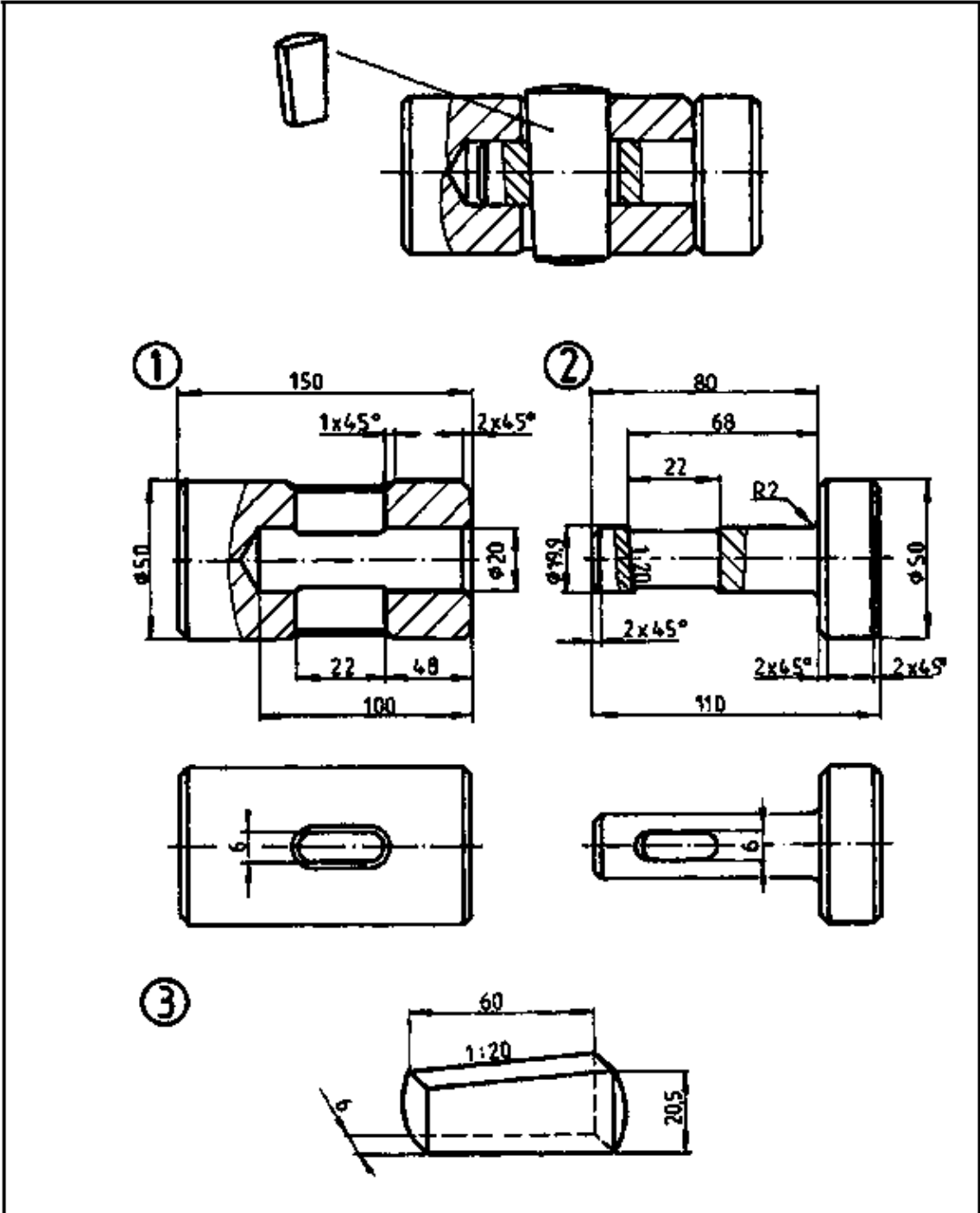
Using light-metal hammer for fixing.

6. Testing the connection.

- Firm fit of sleeve and core
- Firm fit of the cotter
- Even flush of the cotter
- head-ends may project

7. Undoing the connection; dismantling of sleeve and core.

Driving the cotter out with non-ferrous metal arbor.



				35.4.
IBE	Cotter Joint			3135

