Thread Cutting by Dies and Taps – Course: Techniques for Machining of Material – Instruction Examples for Practical Vocational Training.

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Introduction

This material presents four selected instruction examples for applying and consolidating knowledge and skills in “thread cutting by dies and taps”.

The necessary materials, tools, measuring and checking means, and accessories have been indicated for each instruction example to ease preliminary work and execution. In instruction example one the steel has been designated in “megapascal” (MPa) units.

Furthermore, basic knowledge which is required in addition to facts about “thread cutting by dies and taps” is set out. We recommend that all basic knowledge is repeated prior to commencing operations.

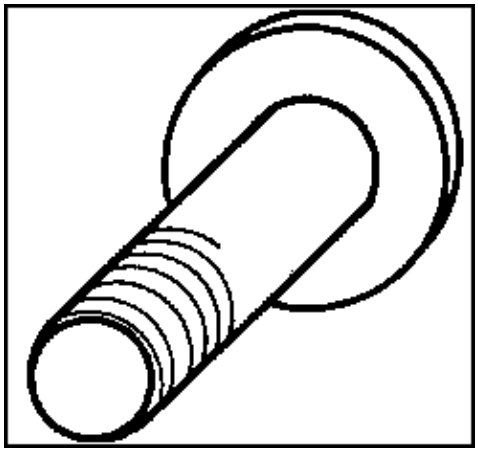
The respective work sequences feature all steps required to turn out a certain workpiece. Adhere to this sequence in order to attain good quality.

Each instruction example has attached a workshop drawing from which the desired shapes and dimensions of the workpiece can be determined. The following table shows dimensional deviations where no tolerances are involved:

Nominal dimension	Permissible deviation in mm
0.5 – 6	± 0.1
6 – 30	± 0.2
30 – 120	± 0.3
120 – 315	± 0.5

Instruction example 5.1. Spring bolt

This example focuses attention on thread cutting by dies on simple cylindrical workpieces.



Material

stand. 42 (steel with a tensile strength of up to 420 MPa)

Dimensions

Ø 38 x 96

Tools

recessed right–side cutting turning tool, die M 20, chucking spanner

Measuring and testing tools

vernier caliper, thread ring gauge M 20

Accessories

extendable chucking jaws, rotating tip, log measure 45 mm, coolants and cutting compounds

Required previous knowledge

drawing comprehension, measuring and testing, thread cutting by hand, longitudinal turning and surfacing, possibilities and employment of chucking and accessories

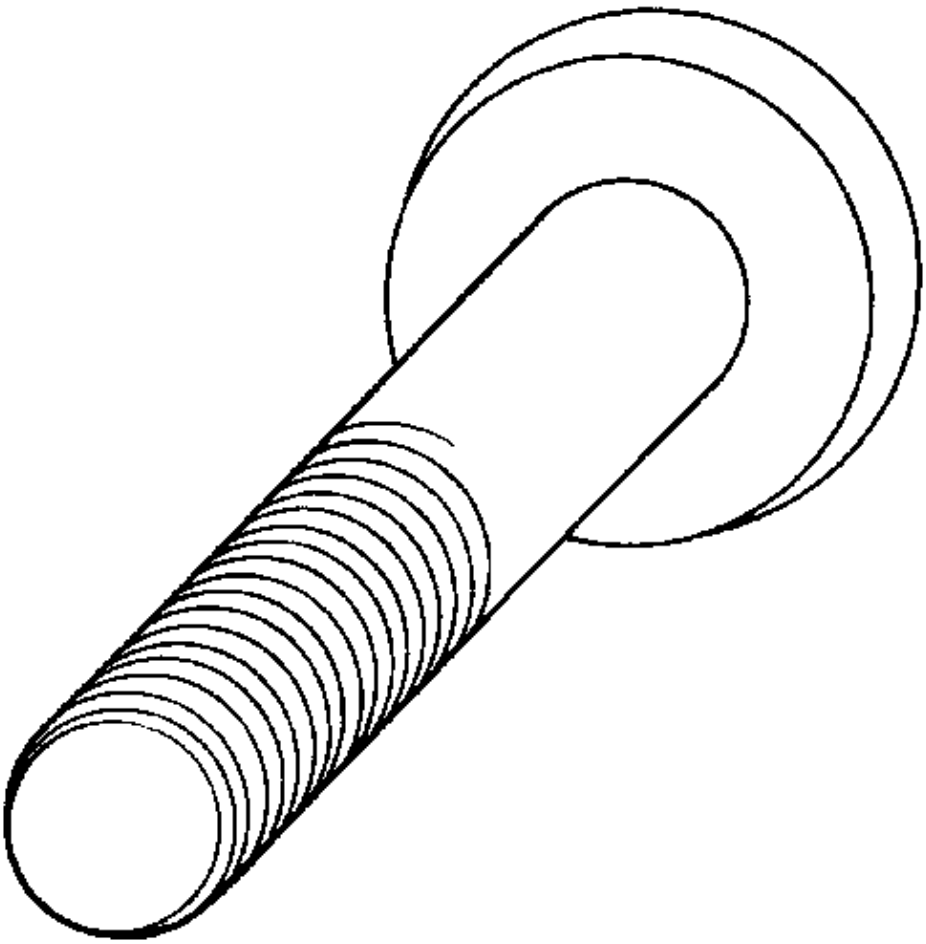
Workshop drawing explanations

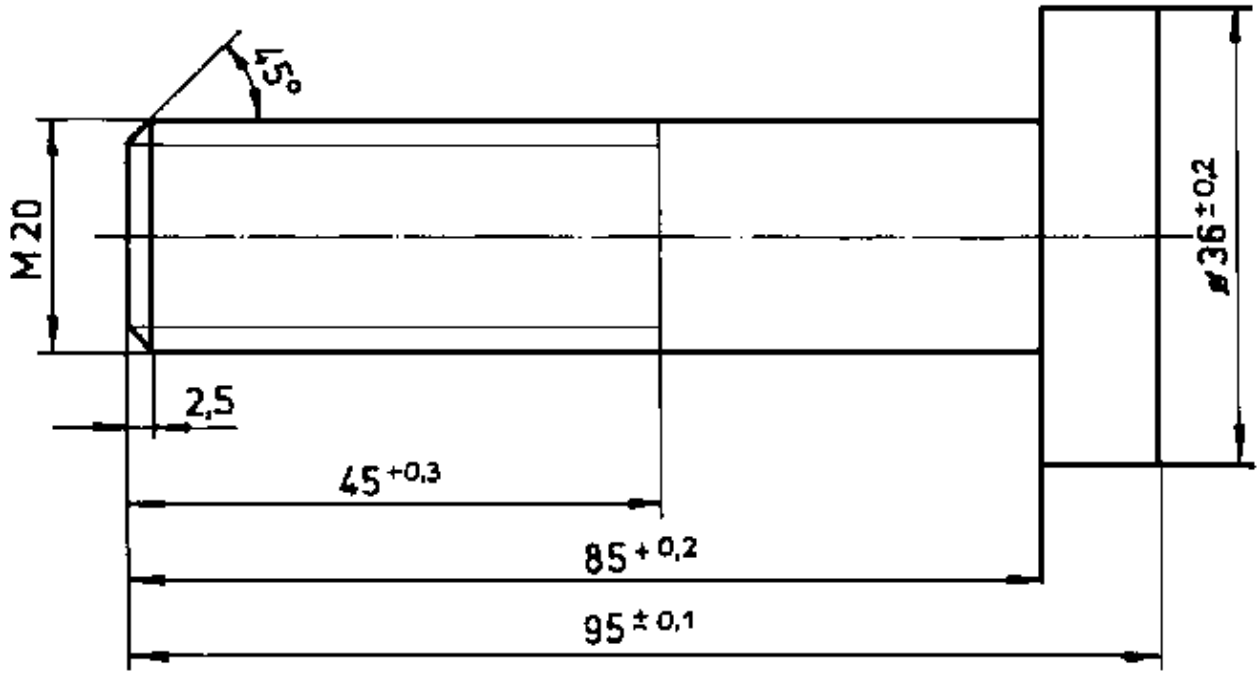
M 20: M = metric thread
20 = nominal diameter

All surfaces have been machine–finished.

Sequence of operations	**Remarks**
1. Dimensional inspection	
2. Clamp workpiece	Clamping in extendable jaws to Ø 36 mm
3. Clamp tool	
4. Set the cutting values for longitudinal turning	

5. Yield thread Ø M 20	Clamping – rotational tip in diameter 20 mm x 45 mm to 19.8 mm as, whilst cutting, the external diameter increases by about 1/10 of the thread increment amount. Deburring of the workpiece 2.5 mm x 45°!
6. Set the cutting values for thread cutting	For steel v = 3 – 4 m min^{-1}
7. Position die	Straight positioning by pressing down the quill
8. Cut the thread	It is sensible to cut a few turns by hand whilst the machine is switched off. Ensure proper cooling and lubrication. Keep the chip chambers clean. Ensure that the tool frame of the die holder is supported. Prior to machine reverse also turn back several times by hand.
9. Unload the workpiece	
10. Dimensional inspection	

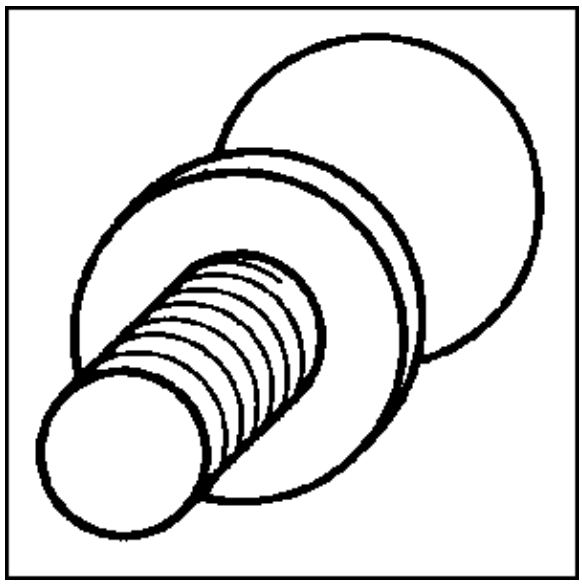




				5.1.
	Spring bolt			3205

Instruction example 5.2. Ball handle

In this example thread cutting by dies on recessed cylindrical workpieces is practised.



Material

16 Mn Cr 5 (low–alloyed steel, alloy components: 0.16 % carbon, 1.25 % manganese, less than 1 % chrome, rest iron)

Dimensions

Ø 42 x 87

Tools

offset right–hand cutting turning tool, die M 24, clamping spanner

Measuring and testing tools

vernier caliper, thread ring gauge M 24

Accessories

extendable chucking jaws, coolants and lubricants

Required previous knowledge

drawing comprehension, measuring and checking, thread cutting by hand, longitudinal turning and surfacing

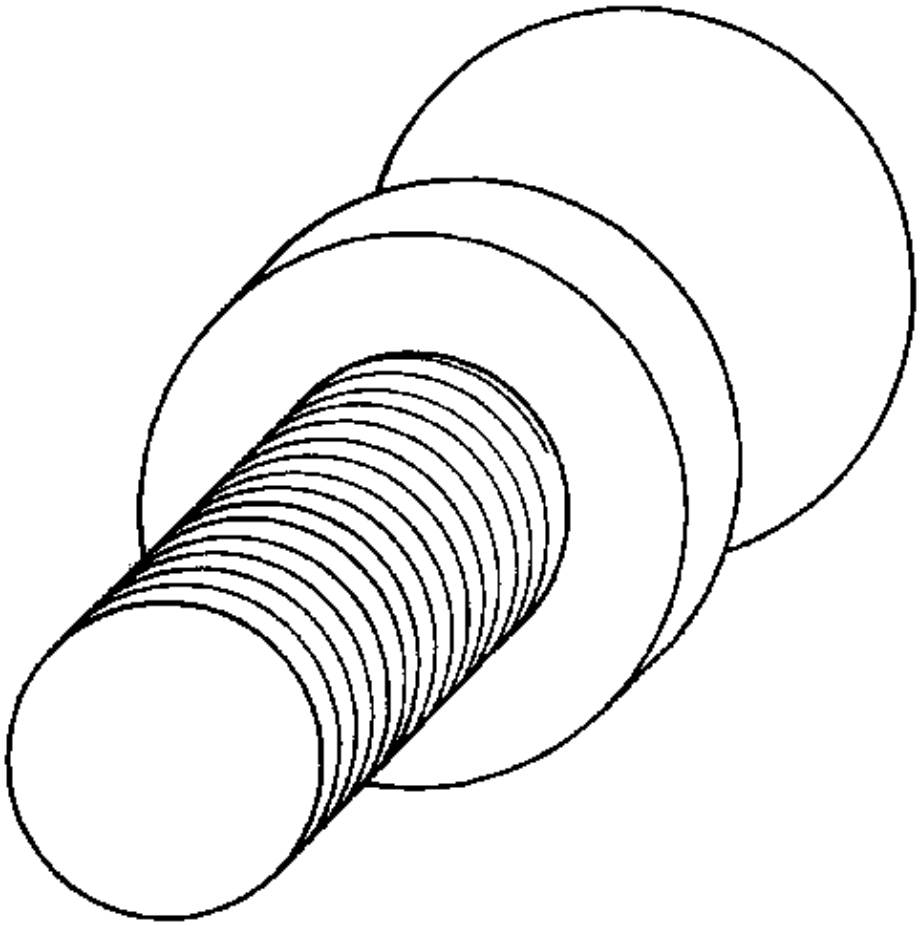
Workshop drawing explanations

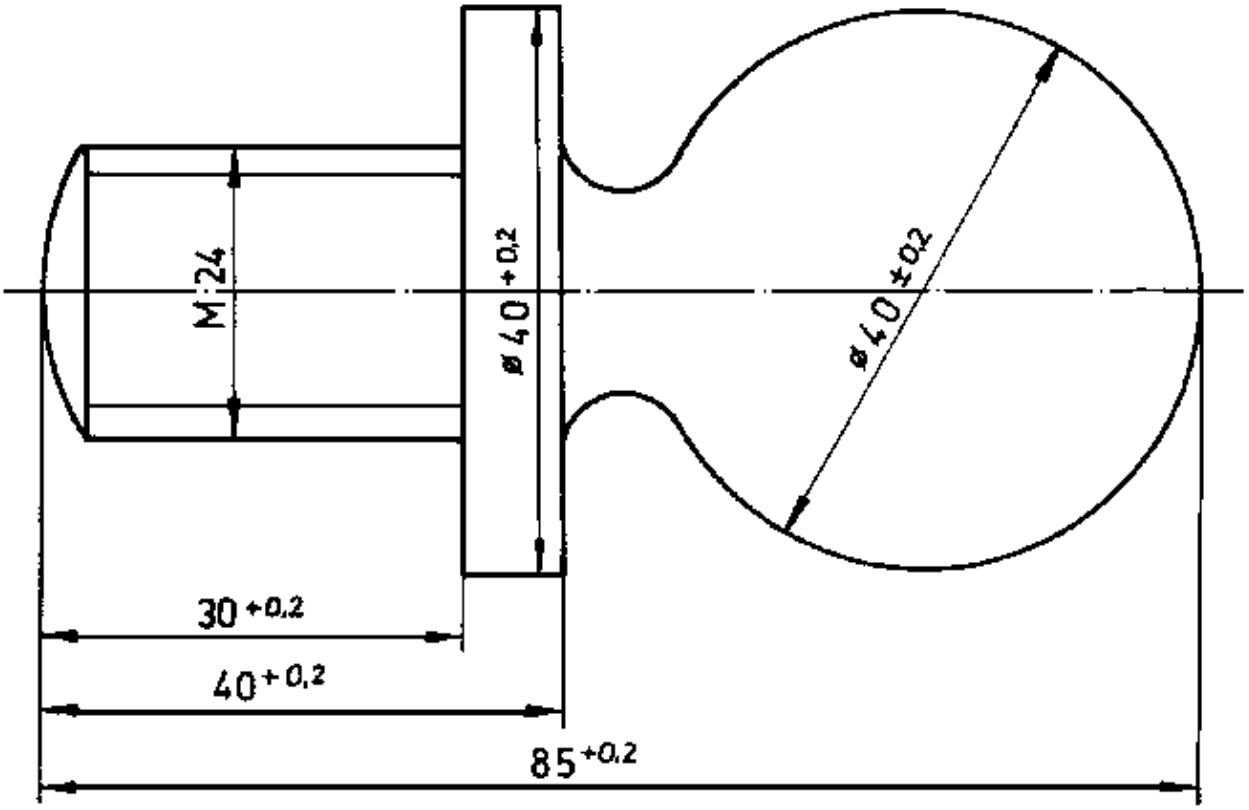
M 24: M= metric thread
24 = nominal diameter

All surfaces have been machine–finished.

Sequence of operations	**Remarks**

1. Dimensional inspection	
2. Clamp workpiece	Clamping in extendable jaws to Ø 40 mm (collar)
3. Clamp tool	
4. Set the cutting values for longitudinal turning	
5. Yield thread Ø M 24	Clamping in extendable chucking jaws. Diameter 24 x 30 mm to 23.7 x 30 mm as, whilst cutting, the external diameter increases by about 1/10 of the thread increment amount. Deburring of the workpiece.
6. Set the cutting values for thread cutting	For steel $v = 3 – 4$ m min^{-1}.
7. Position die	Straight positioning by pressing down the quill
8. Cut the thread	It is sensible to cut a few turns by hand whilst the machine is switched off. Ensure proper cooling and lubrication. Keep the chip chambers clean. Switch off the machine about 2 – 3 mm before attaining the collar Ø 40 mm and cut the last turns by hand.
9. Unload the workpiece	
10. Dimensional inspection	



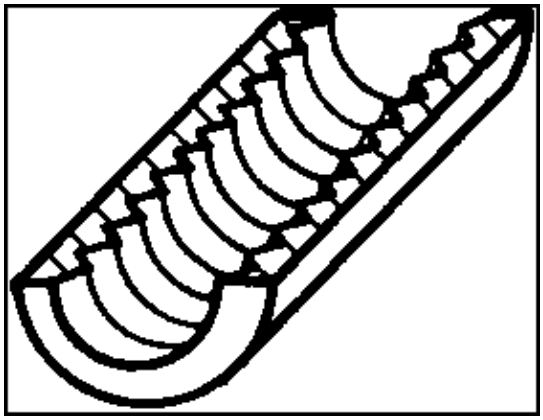


				5.2.
	Ball handle			3205

Ball handle

Instruction example 5.3. Lance

In this example particular attention is given to practising thread cutting by tap on through holes.



Material

35 Cr Al 6 (low–alloyed steel, alloy components: 0.35 % carbon, 1.5 % chrome, 1 % aluminium, rest iron)

Dimensions

Ø 52 x 87

Tools

bent right internal roughing lathe, clamping spanner, one set of hand taps M 30

Measuring and testing tools

internal thread gauge M 30, vernier caliper

Accessories

extendable chucking jaws, tap wrench, coolants and lubricants

Required previous knowledge

drawing comprehension, measuring and checking, thread cutting by hand, centring, boring, counter–boring

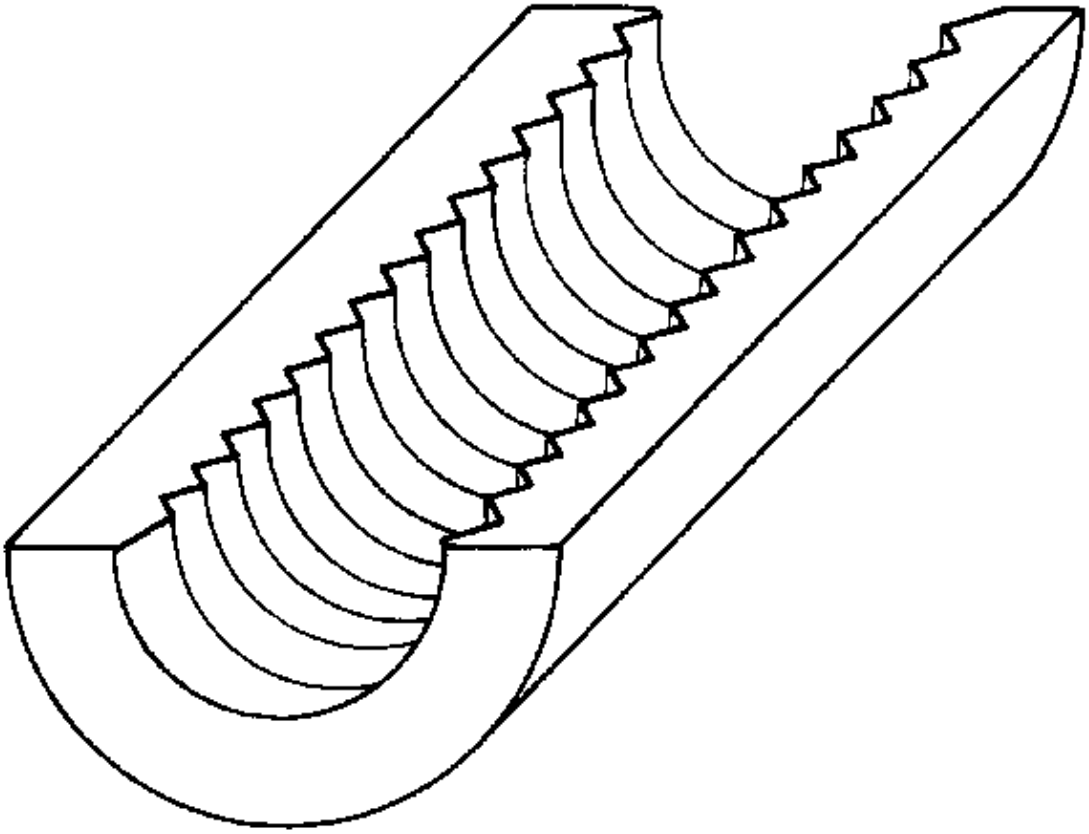
Workshop drawing explanations

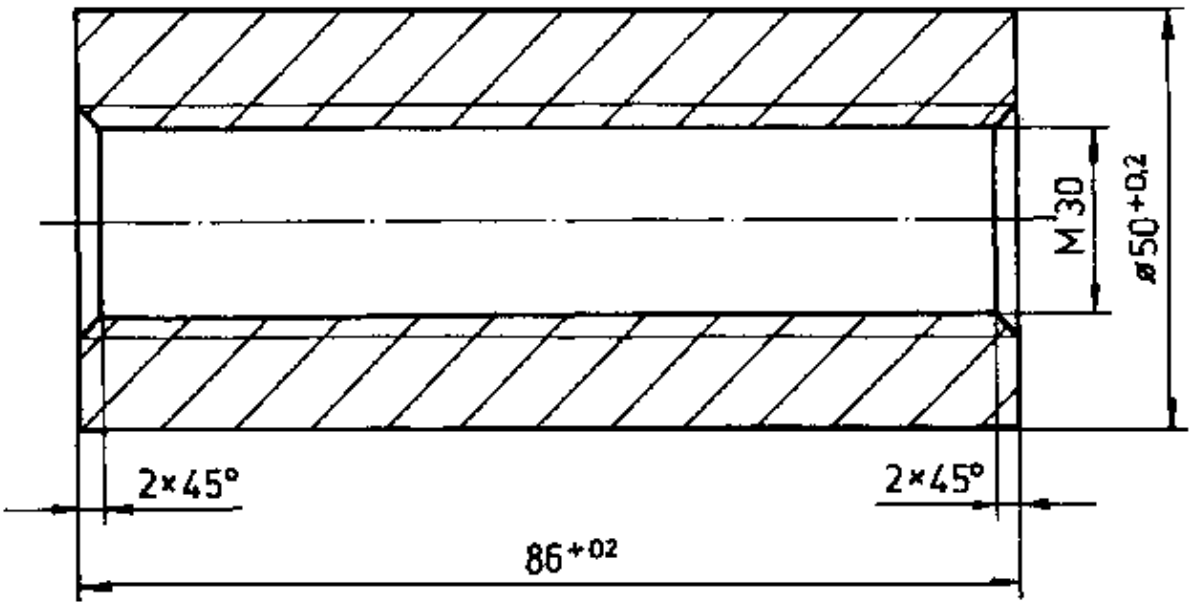
M 30: M = metric thread
30 = nominal diameter

All surfaces have been machine–finished.

Sequence of operations	**Remarks**
1. Dimensional inspection	
2. Clamp workpiece	Clamping in extendable chucking jaws. Ensure true running.

3. Clamp tool	Use prismatic base as lathe has a round shank.
4. Set the cutting values for boring	
5. Yield thread Ø M 30	Bore to Ø 26.7. Material is compressed during thread cutting resulting in a bore diameter decrease. Debur 2 mm x 45°!
6. Set the cutting values for thread cutting	For steel v = 4 – 15 m min^{1} according to material and thread size
7. Position tap	Select manual tap. Position the railstock tip to centring of tap.
8. Cut the tap	Sequence – entering tap, plug tap thread, plug (third) tap. Initially use the plug tap and plug (third) tap to undertake several turns by hand so that the tap sets to the prenotched thread. Ensure tap wrench support. Keep the chip grooves clean by turning back the tap several times. Ensure proper cooling and lubrication. Indicate possible accident hazards 1
9. Unload the workpiece	
10. Dimensional inspection	



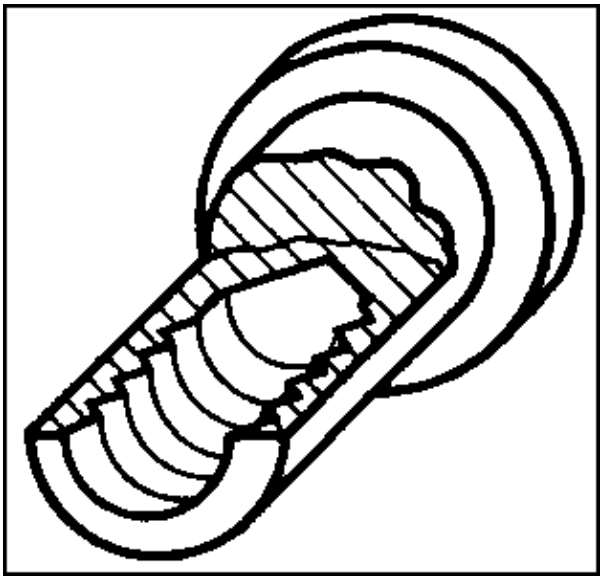


				5.3.
	Lance			3205

Lance

Instruction example 5.4. Piston

In this example thread cutting is undertaken in blind holes by means of taps.



Material

16 Cr Mo 4 (low–alloyed steel), alloy components: 0.16 % carbon, 1 % chrome, less than 1 % molybdenum, rest iron.

Dimensions

Ø 45 x 93

Tools

spiral drill Ø 17.5 mm, machine tap M 20, chucking spanner

Measuring and testing tools

vernier caliper, steel measure

Accessories

extendable chucking jaws, tap wrench, reducing collars, coolants and lubricants

Required previous knowledge

drawing comprehension, measuring and checking, thread cutting by hand, centring, boring, counter–boring

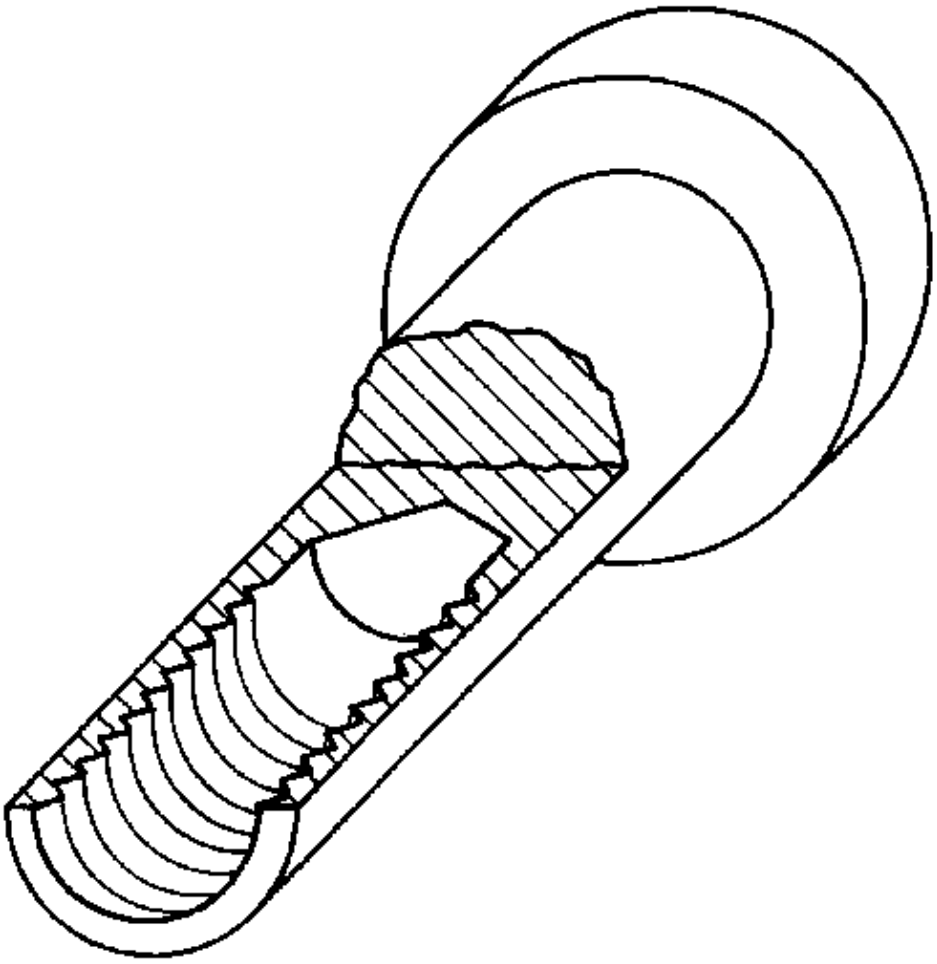
Workshop drawing explanations

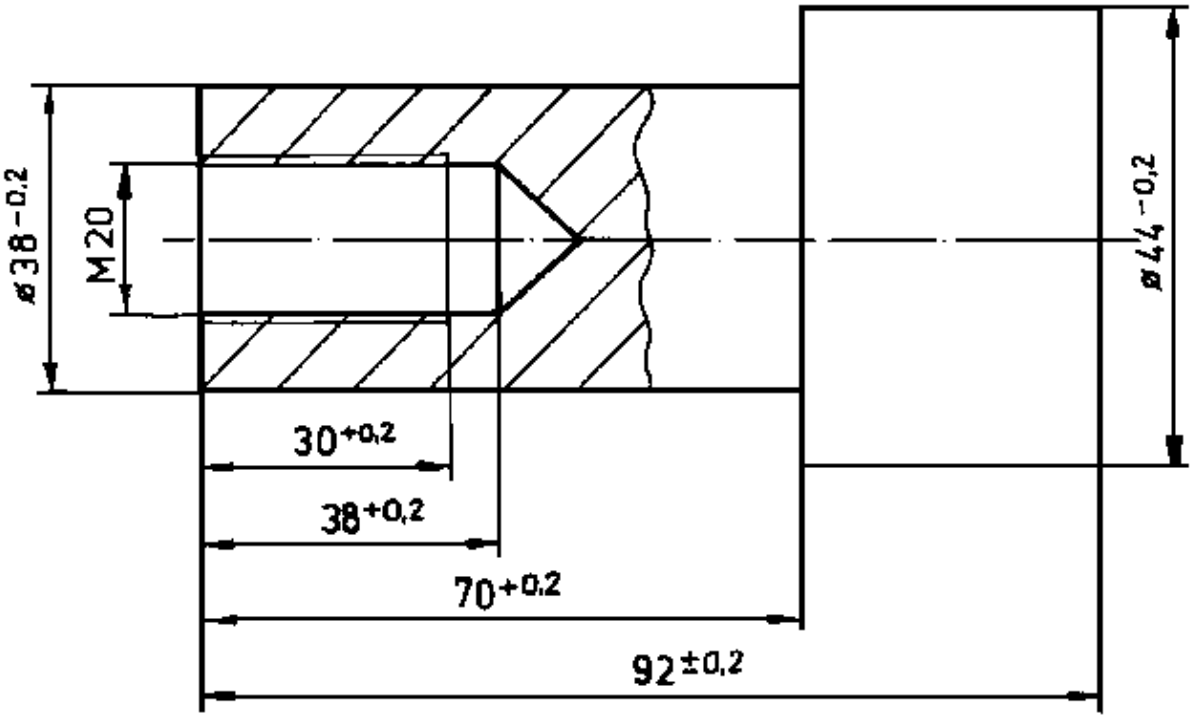
M 20: M = metric thread
20 = nominal diameter

All surfaces have been machine–finished.

Sequence of operations	**Remarks**
1. Dimensional inspection	
2. Clamp workpiece	Clamping in extendable jaws to Ø 38 mm

3. Clamp tool	Fix spiral drill to tailstock by means of reducing collars
4. Set the cutting values for boring	Spiral drill is made of quick–cutting steel v = 25 – 50 m min^{-1}
5. Undertake a Ø 17.5 x 38 mm bore	Ensure proper cooling. Check bore depth with steel measure on the quill. Debur the workpiece.
6, Set the cutting values for thread cutting	For steel v = 4 – 15 m min^{-1} heeding the material and thread size
7. Position tap	Select machine tap. Position the railstock tap to centring of tap.
8. Cut the tap	Ensure tap wrench support. Check on proper alignment through the railstock tip. Keep the chip grooves clean by turning the tap back several times. Ensure proper cooling and lubrication. Ensure adherence to 30 mm length.
9. Unload workpiece	
10. Dimensional inspection	





				5.4.
	Piston			3205