



**higher education  
& training**

Department:  
Higher Education and Training  
**REPUBLIC OF SOUTH AFRICA**

# **MARKING GUIDELINE**

**NATIONAL CERTIFICATE (VOCATIONAL)**

**FITTING AND TURNING  
NQF LEVEL 2**

**21 NOVEMBER 2017**

**This marking guideline consists of 7 pages.**

**QUESTION 1: GRINDING AND SHARPENING**

- 1.1
- Safety glasses (goggles) which must have side shields
  - Any form of hearing protection
  - Dust mask (Face mask)
  - Overall
  - A hair net if worker has long hair
  - Safety shoes with a steel toecap
- (Any 3 × 1) (3)
- 1.2
- Silicate
  - Ceramic
  - Rubber
  - Shellac
  - Synthetic resin
- (Any 3 × 1) (3)
- 1.3
- 1.3.1 False
- 1.3.2 False
- (2 × 1) (2)
- 1.4
- If an employee needs to leave a pedestal grinding machine for any reason while working on it, the power should be locked out to prevent someone from switching it on. A special lock-out tag is available for that purpose. (2)
- 1.5
- Sound test
  - Spark test
  - Fracture test
  - Machining test
- (Any 2 × 1) (2)
- 1.6
- 1.6.1 B
- 1.6.2 C
- 1.6.3 A
- (3 × 1) (3)
- 1.7
- 1.7.1
- Side clearance angle
  - Front clearance angle
  - End relief angle
- (3)
- 1.7.2
- Top rake angle
  - Side rake angle
  - Back rake angle
- (Any 2 × 1) (2)
- [20]**

**QUESTION 2: DRILLING MACHINES**

- 2.1      2.1.1      Countersinking – To provide a recess for a countersunk screw/-  
Remove burrs from drilled holes.
- 2.1.2      Counterboring – To provide a hole for cap screws so that once they  
have been tightened, the top of the cap screw is level with the  
surface of the work-piece.
- 2.1.3      Spot facing – To provide a flat surface for bolts or nuts on castings.
- 2.1.4      Centre drilling – To provide a pilot hole for a large diameter twist  
drill.
- 2.1.5      Reaming – Provides accurate and smooth holes after normal twist  
drilling. (5 × 1)      (5)
- 2.2      The full diameter of the drill should enter the work-piece before the point  
breaks through the plate, otherwise the drill will grab the plate and rip it loose  
from the clamp. To avoid that, the drill point should be grounded to a very  
shallow angle and the work-piece should be very securely clamped down on  
top of a wooden block by using the appropriate clamping method.  
(Any relevant answer)      (3)
- 2.3      D = ?
- N = 200 r/min
- S = 35 m/min
- S =  $\pi \times D \times N$
- D =  $\frac{S}{\pi \times N}$   
=  $\frac{35}{\pi \times 200}$  ✓  
= 0,0557 m ✓  
= 55,7 mm ✓  
= thus 56 mm (3)
- 2.4      • Clamp the work-piece firmly.  
• Choose the correct drill type.  
• Tighten the drill in the chuck.  
• Set the machine to the correct speed.  
• Align the drill to the hole to be drilled. (5)
- 2.5      • Keeps drill and work-piece cool, thus increases the lifespan of the drill.  
• Provides a good finish on the work-piece.  
• Higher cutting speeds can be used.  
• Increases production.  
• Washes away dirt and shavings. (Any 3 × 1)      (3)

- 2.6 Information is normally saved for reference purposes in future. (1)  
[20]

**QUESTION 3: HAND THREADING AND REAMING**

- 3.1 Multi-start screw threads will advance quicker for every full turn of the bolt or nut. Used where quick loosening and tightening of bolts and nuts are required. (1)
- 3.2 3.2.1 • Vehicle jacks  
• Bench vices (2 × 1) (2)
- 3.2.2 It can absorb large axial loads from one direction. (1)
- 3.3 • Split die  
• Solid die  
• Rectangular die (3)
- 3.4 It is a quick method to check whether the tapped or reamed hole is the correct size. (1)
- 3.5 Tap drill size = major diameter – pitch  
= 10 – 1,25✓  
= 8,75 mm✓ (2)  
[10]

**QUESTION 4: KEYS AND FASTENERS**

- 4.1 Keys and keyways are used to secure gears, pulleys etc. to the shaft to enable the transmission of drive from a machine. (Any relevant answer) (1)
- 4.2  $h = D/6$   
= 100/6✓  
= 16,7 mm✓
- $w = D/4$   
= 100/4✓  
= 25 mm✓ (4)
- 4.3 4.3.1 It is the cylindrical portion of the screw or bolt from the underside of the head to the tip.
- 4.3.2 It is the unthreaded section between the screw thread and the underside of the head of the screw or bolt. (2 × 1) (2)

- 4.4 4.4.1 It is a bolt with a head and a shank that contains a screw thread. It is used with nuts or fitted into a hole with a screw thread.
- 4.4.2 It is a bolt that has no head and has screw thread on both sides with a shoulder in the middle. (2 × 1) (2)
- 4.5 Tab washers have a small tab on the side of the washer that can be bent upwards after the nut has been tightened. This will prevent the nut from loosening with vibration. (1) [10]

**QUESTION 5: CENTRE LATHE**

- 5.1
- Wear goggles.
  - Never make any adjustments while the machine is in motion.
  - Do not leave the machine unattended.
  - Clamp the work-piece securely.
  - Don't wear loose clothing.
  - Don't wear jewellery.
  - Ensure that all the guards are in position.
  - Do not attempt to load a work-piece before the spindle is completely stationary.
  - Do not remove any shavings with your hands. Use the appropriate hook or brush for that purpose.
  - Do not use a hacksaw, file, emery paper or any other hand tool on a lathe to improve the finish or remove material. (Any 5 × 1) (5)
- 5.2
- Drilling.
  - To support the right-hand end of the work-piece.
  - In conjunction with a centre, to set cutting tools to centre height. (Any 2 × 1) (2)
- 5.3 5.3.1
- Plain or solid
  - Screw
  - Expanding
  - Double cone (Any 2 × 1) (2)
- 5.3.2 When a work-piece cannot be held between centres or clamped to a faceplate due to its shape, it can be mounted to a mandrel to be machined. (1)
- 5.4 The gap part of the bed can be removed if work-pieces with large diameters must be machined. (1)

- 5.5
- Using the handles, advance the tool until it just touches the face of the work-piece. If the work-piece is rotated by hand it should make a very fine cut on the workpiece.
  - Withdraw the tool by using the cross-slide handle.
  - Set the compound slide dial to zero.
  - Ensure that there is no backlash present. The dial is now set and the machine is ready for use.
- (4)
- 5.6
- Outside micrometers
  - Depth micrometers
  - Vernier calliper
  - Go/no-go gauges
  - Screw thread pitch gauge
- (Any relevant 2 × 1) (2)
- 5.7
- $D = 30 \text{ mm} = 30/1000 = 0,03 \text{ m}$
- $N = 500 \text{ r/min}$
- $S = \pi \times D \times N$   
 $= \pi \times 0,03 \times 500 \checkmark \checkmark$  (1 mark for conversion of mm to m)  
 $= \underline{47,13 \text{ m/min}} \checkmark$
- (3)  
[20]

### QUESTION 6: MILLING MACHINES

- 6.1
- Plain or horizontal milling machine
  - Universal milling machine
  - Vertical milling machine
  - Turret-type milling machine
- (4)
- 6.2
- 6.2.1 True
- 6.2.2 False
- 6.2.3 True
- 6.2.4 True
- 6.2.5 False
- (5 × 1) (5)
- 6.3
- $S = \pi \times D \times N$   
 $N = \frac{S}{\pi \times D}$   
 $N = \frac{60}{\pi \times 0,01} \checkmark \checkmark$  (1 mark for conversion of mm to m)  
 $N = 1909,61 \checkmark$   
 $N = \text{thus } 1900 \text{ r/min}$
- (3)

6.4	6.4.1	Tolerance refers to the maximum or minimum deviation allowed during a machining process.	(1)
	6.4.2	Maximum = 20,02 mm Minimum = 19,8 mm	(2)
6.5	<ul style="list-style-type: none"><li>• Roughing cutter</li><li>• End-mill cutter</li><li>• Slot drill</li><li>• Ball-nose cutter</li><li>• T-slot cutter</li><li>• Dovetail cutter</li><li>• Ripping cutter</li></ul>	(Any 4 × 1)	(4)
6.6	Surface texture comparison plate		(1)
			<b>[20]</b>
		<b>TOTAL:</b>	<b>100</b>