

University of Wales Trinity Saint David

Wales Institute of Science and Art



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Workshop Logbook

Images

Workshop & Practise ACHA4011

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2212405

October 2023

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1 Introduction

This document serves to provide images relating to the machine workshop and engine workshop logbook coursework. Refer to ACHA4011_Logbook_Oliver_Gillson for literature.

2 Machine Workshop Session 1- Measuring, Marking & Cutting

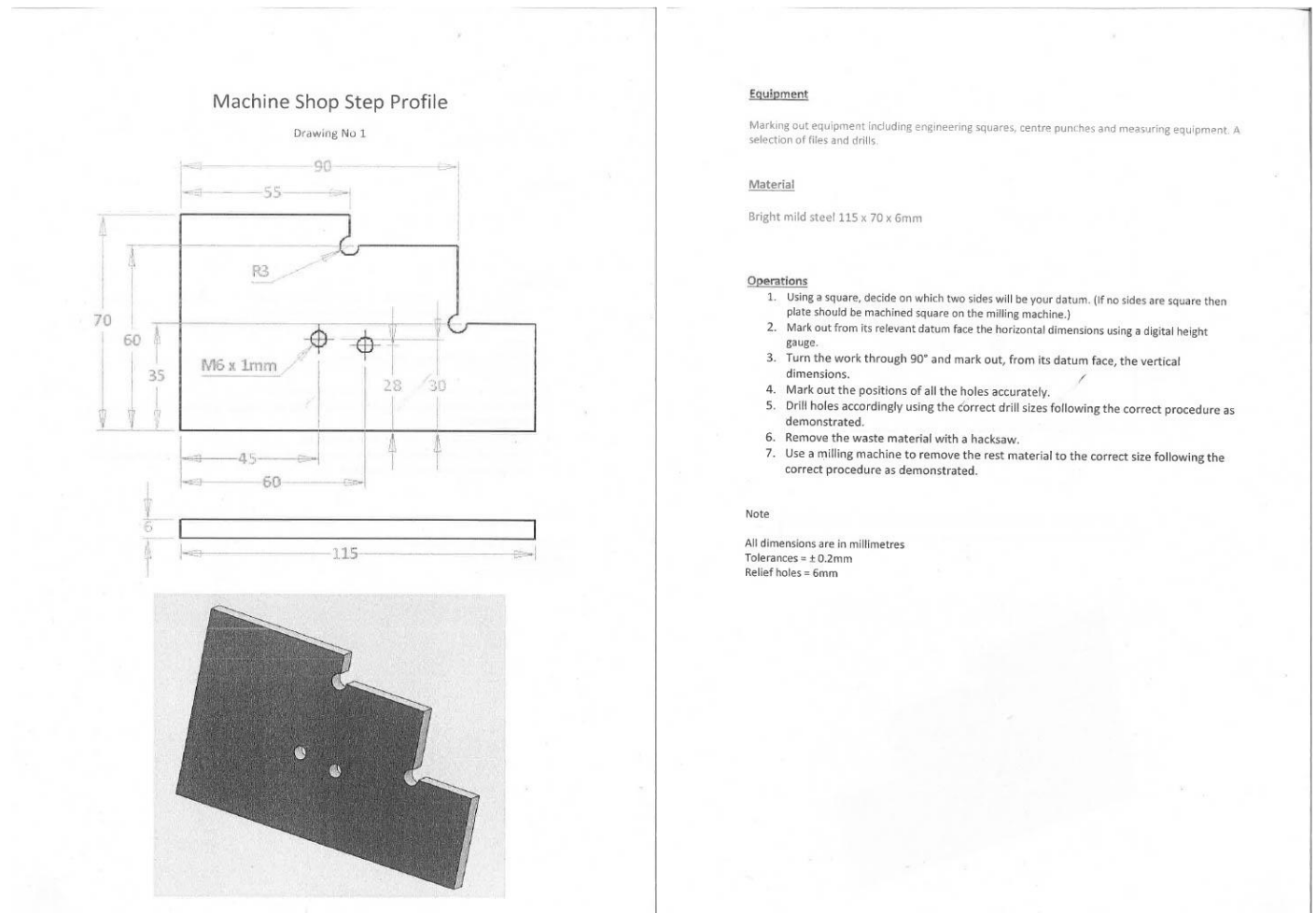


Figure 1: Technical Specifications Sheet

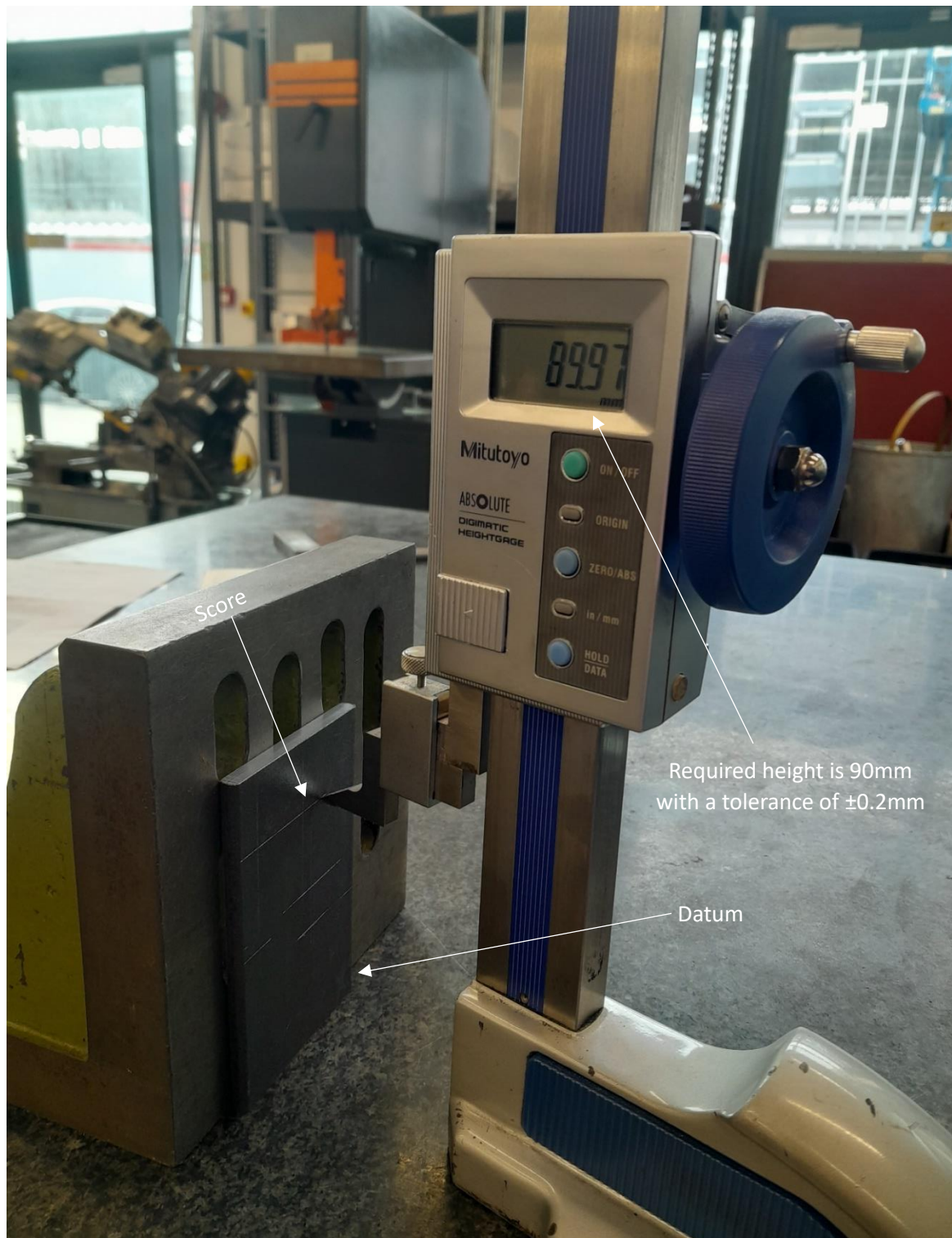


Figure 2: Digital height gauge used to score stock.

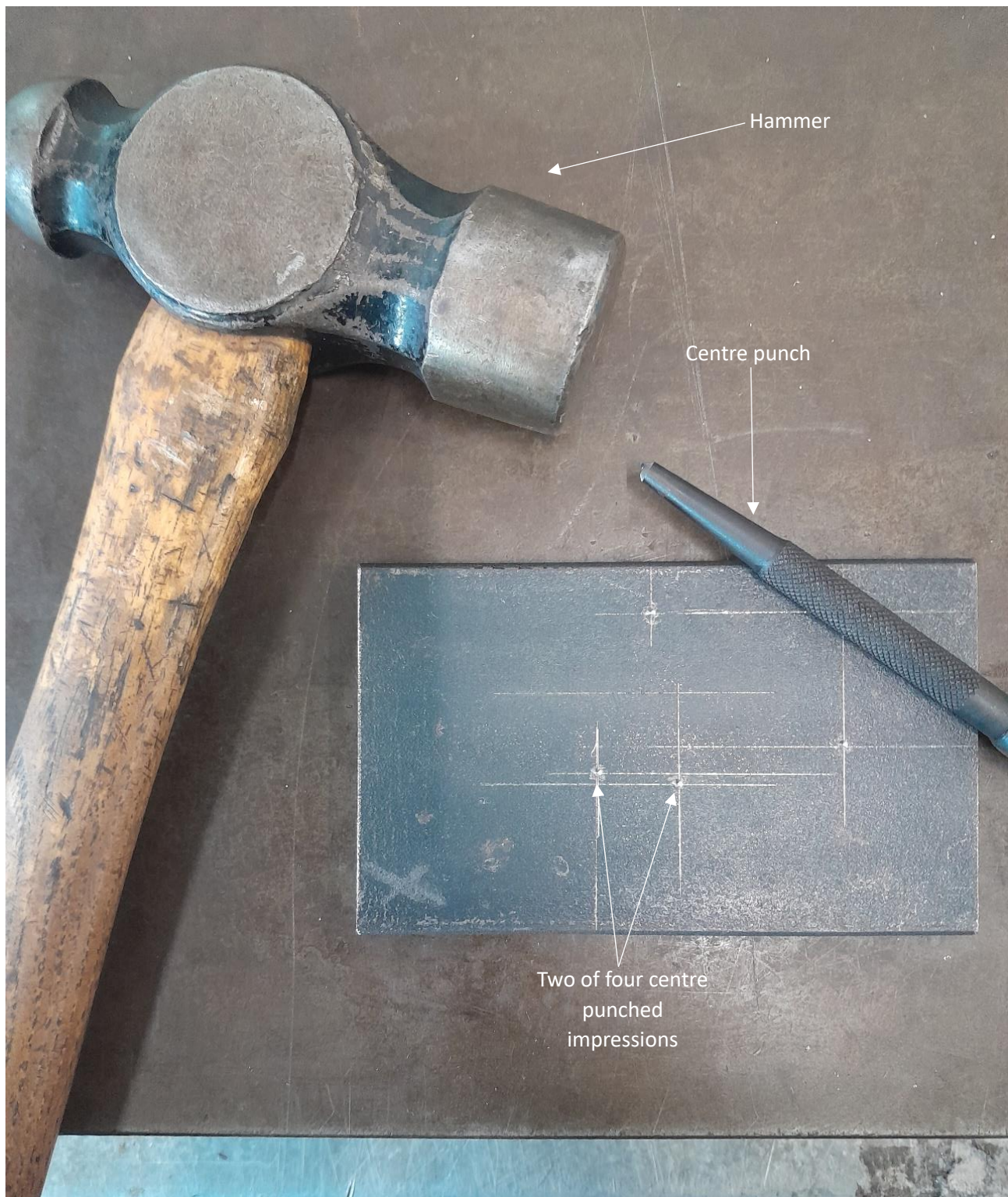


Figure 3: Hammer and centre punch. Note the marks where the centre punch has been used to create an impression.

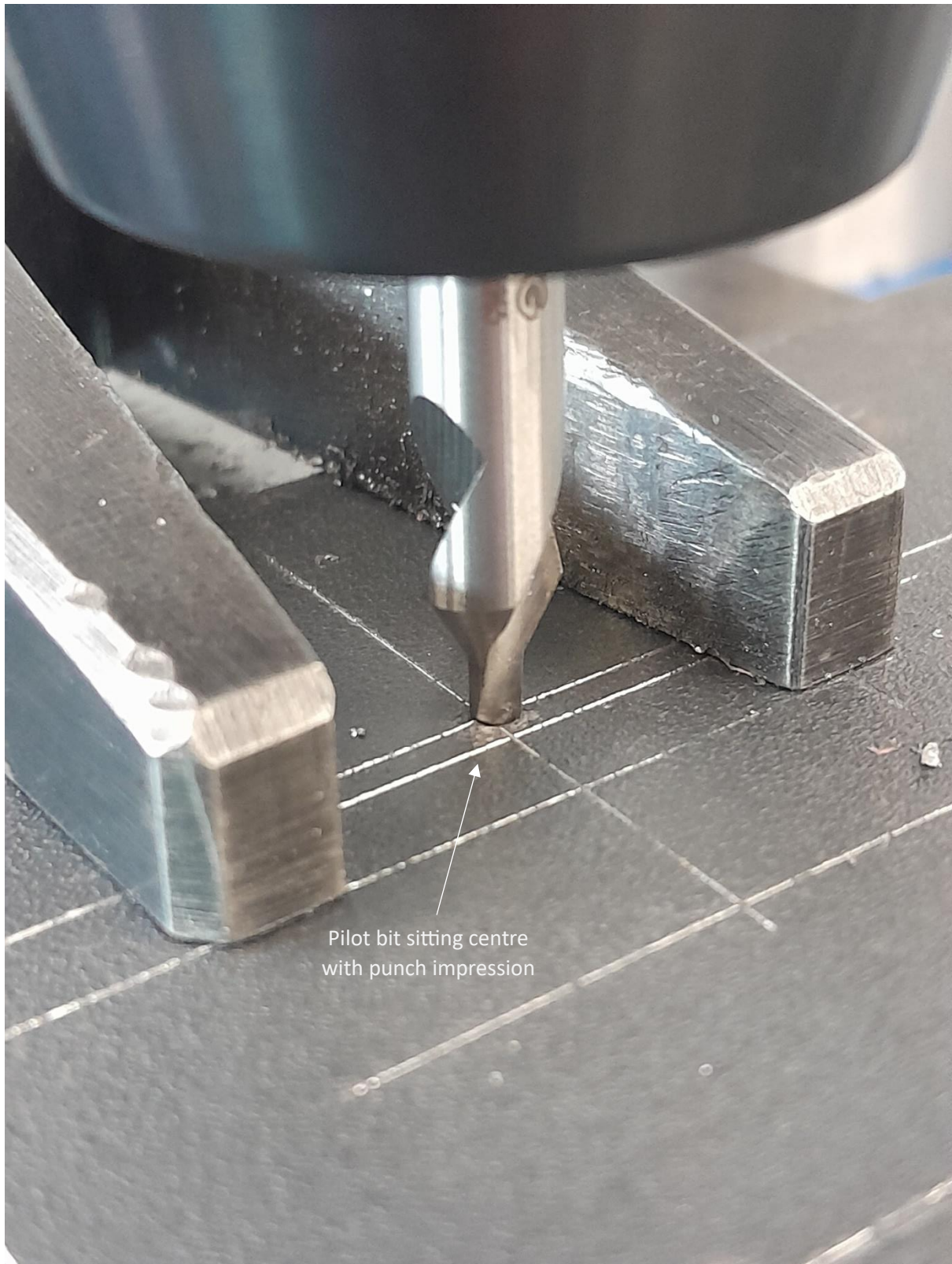


*Figure 4: lining up the pilot bit with centre punch impression.
Note how the jaws of the clamp on stock are correctly seated.*



Figure 6: Adding cutting fluid to M6x1.0 tap.



Figure 5: Checking level of tap after first pass.

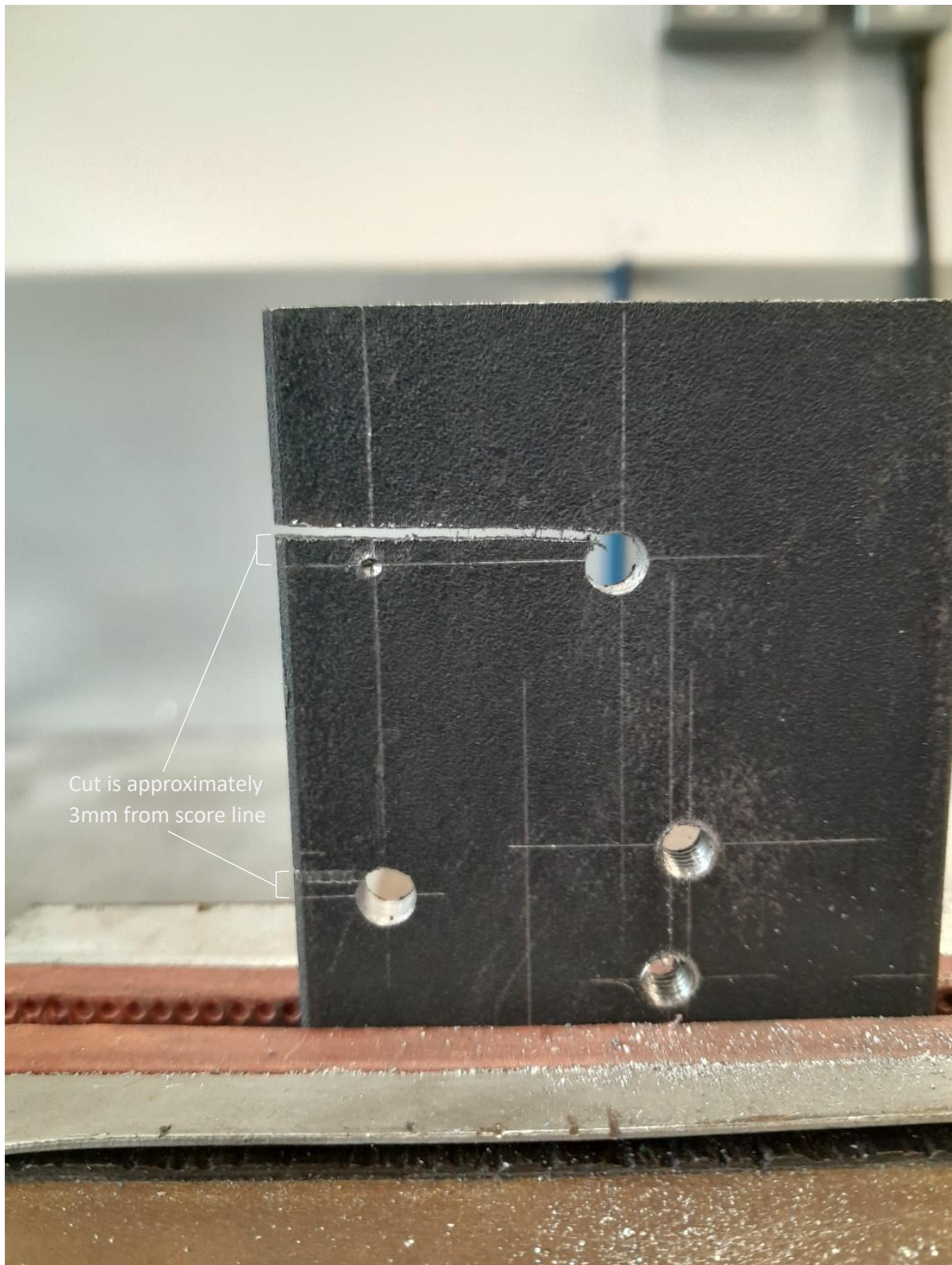


Figure 7: Stock in vice ready to remove bulk of material.

3 Machine Workshop Session 2- Milling Machine Use to Remove Material

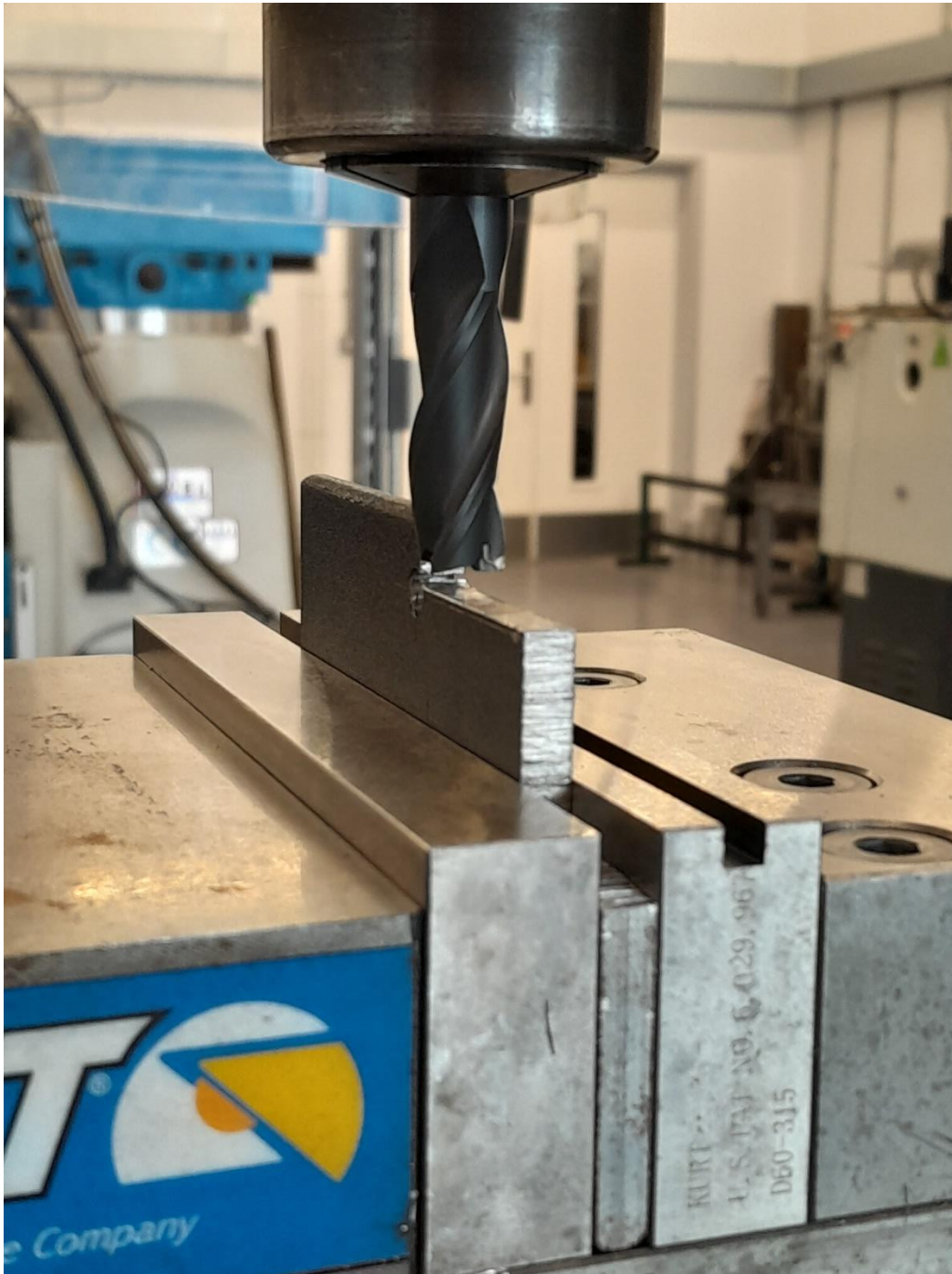


Figure 8: End mill bit centred in z-axis, so bit covers all material.

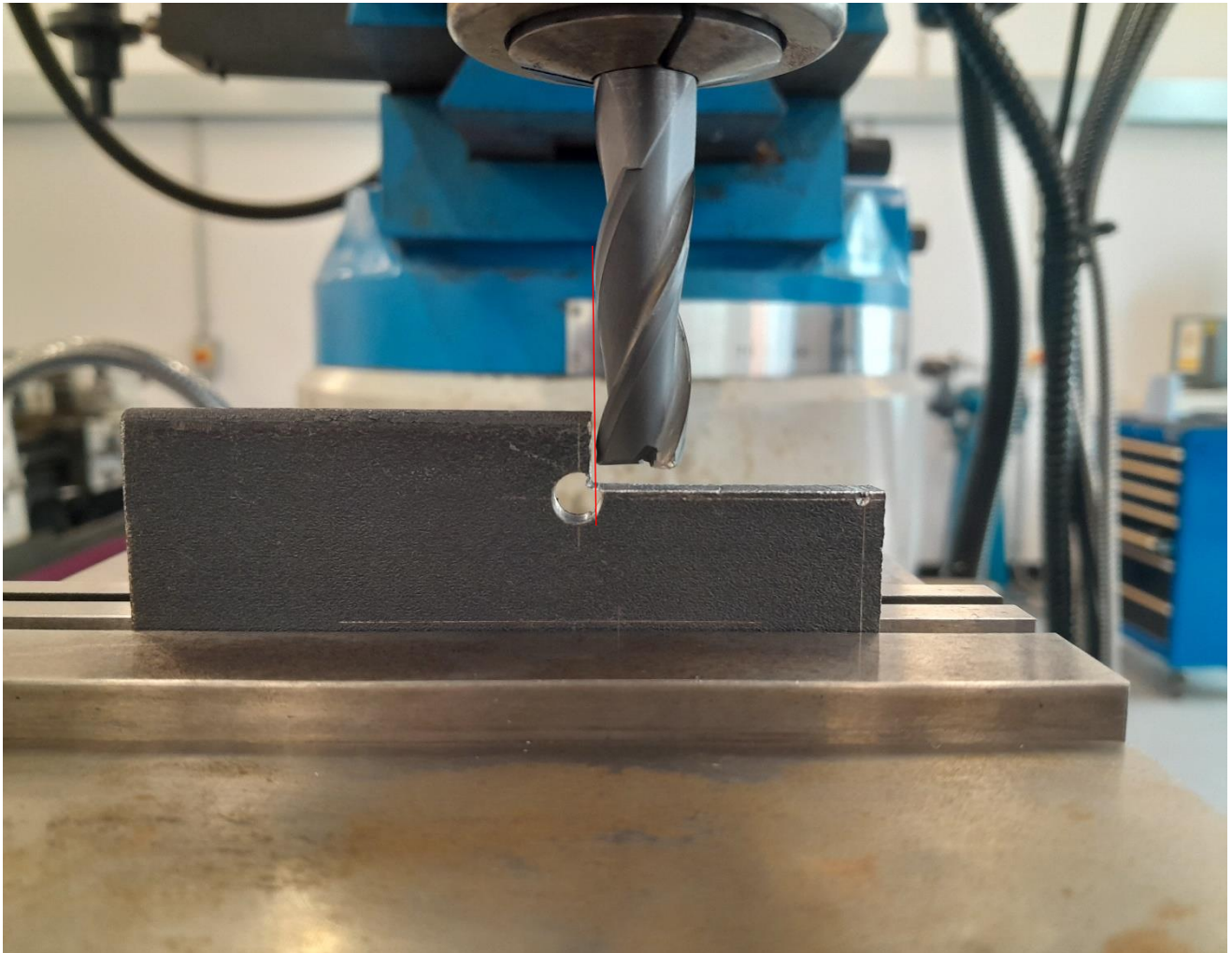


Figure 9: Bit is zeroed on the x-axis (red line shows the bit is over relief cut).

4 Machine Workshop Session 3 - Lathe Setup & Tool Alignment

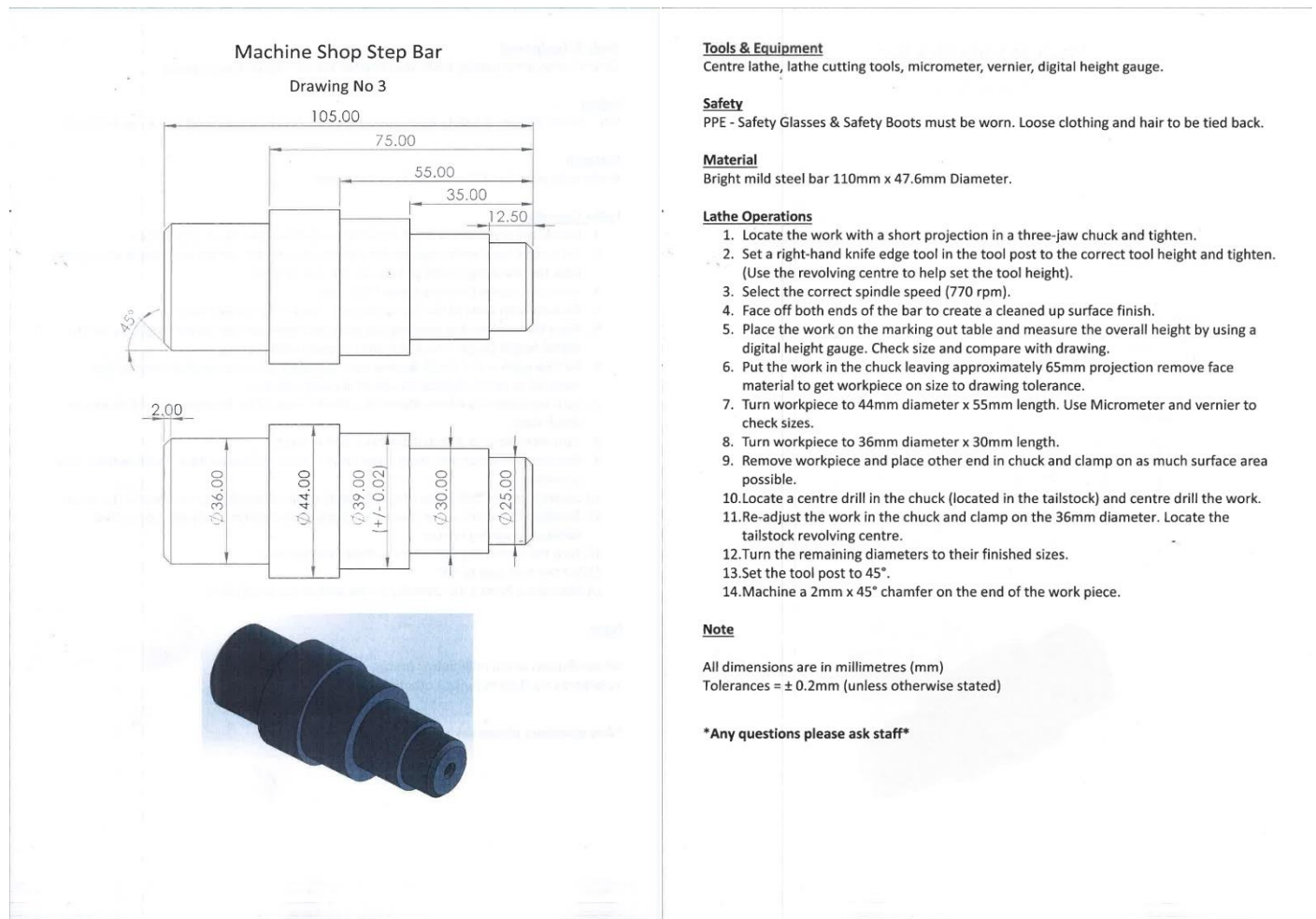


Figure 10: Technical Specifications Sheet

4.1 4.1 Lathe Setup



Figure 11: Lathe control panel showing green power light.



Figure 12: Power switch showing "on" position.



Figure 13: Lathe emergency stop switch.

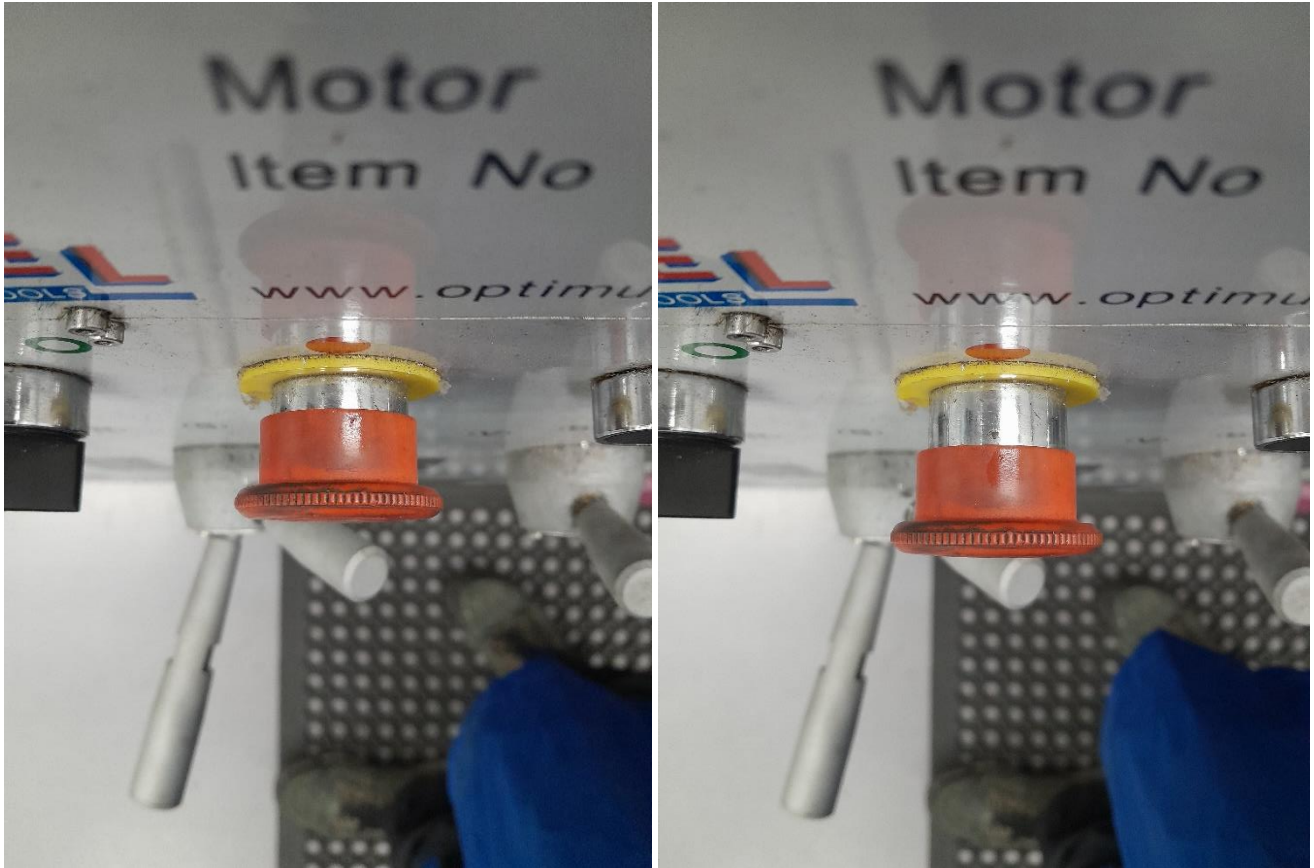


Figure 14: Red lathe stop switch in off/in position (left) and on/out position (right).



Figure 15: Gearbox selection levers



Figure 16: Additional gearbox selection knob located underneath control panel.

4.2 Tool Alignment & Setup



Figure 17: Tail stock wound out past 20mm



Figure 18: Turning centre.

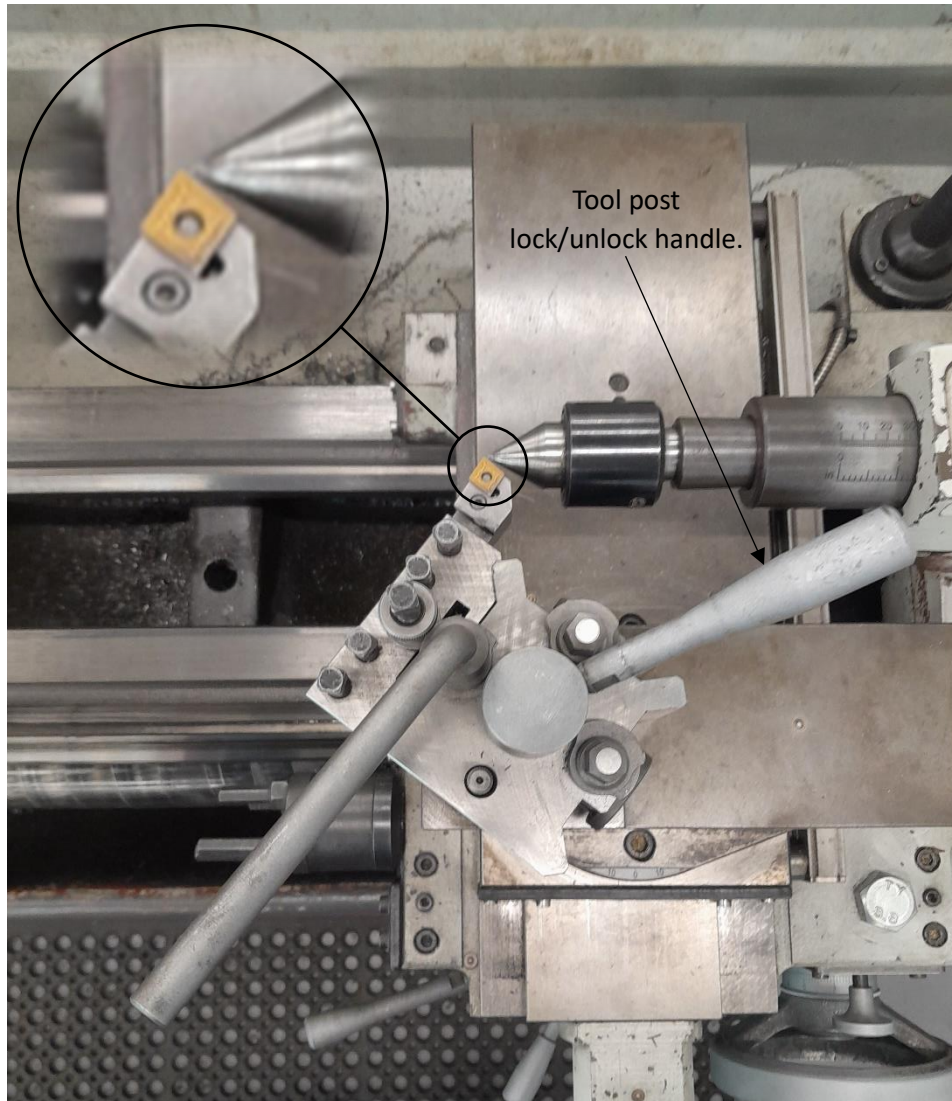


Figure 19: Tool post turned and brought up to turning centre.



Figure 20: Tool post spanner and thumb screw adjuster.



Figure 21: Tool aligned with turning centre.

5 Machine Workshop Session 4 - Facing off Material for Accurate Measuring



Figure 22: Releasing chuck jaws using chuck tool.



Figure 23: Work piece secured in vice jaws.



Figure 24: Cutting tool touch on with work piece.



Figure 25: Measuring faced off work piece.

6 Engine Workshop Session 1 - Engine Casing and Valve Train Removal

6.1 Engine Casing Removal & Timing Adjustments

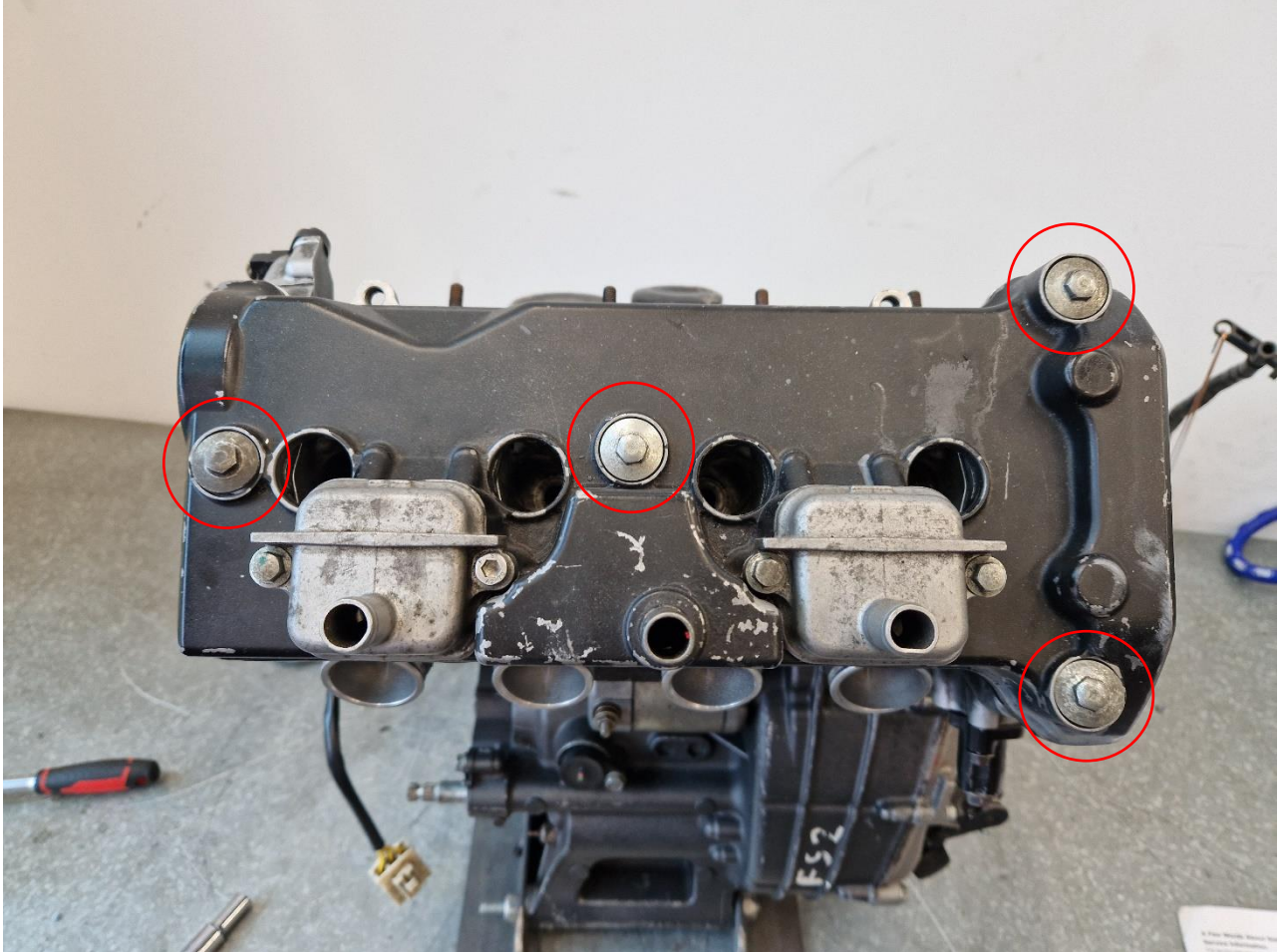


Figure 26: Valve train cover securing bolts circled red.



Figure 27: Stator cover bolt holes circled red.

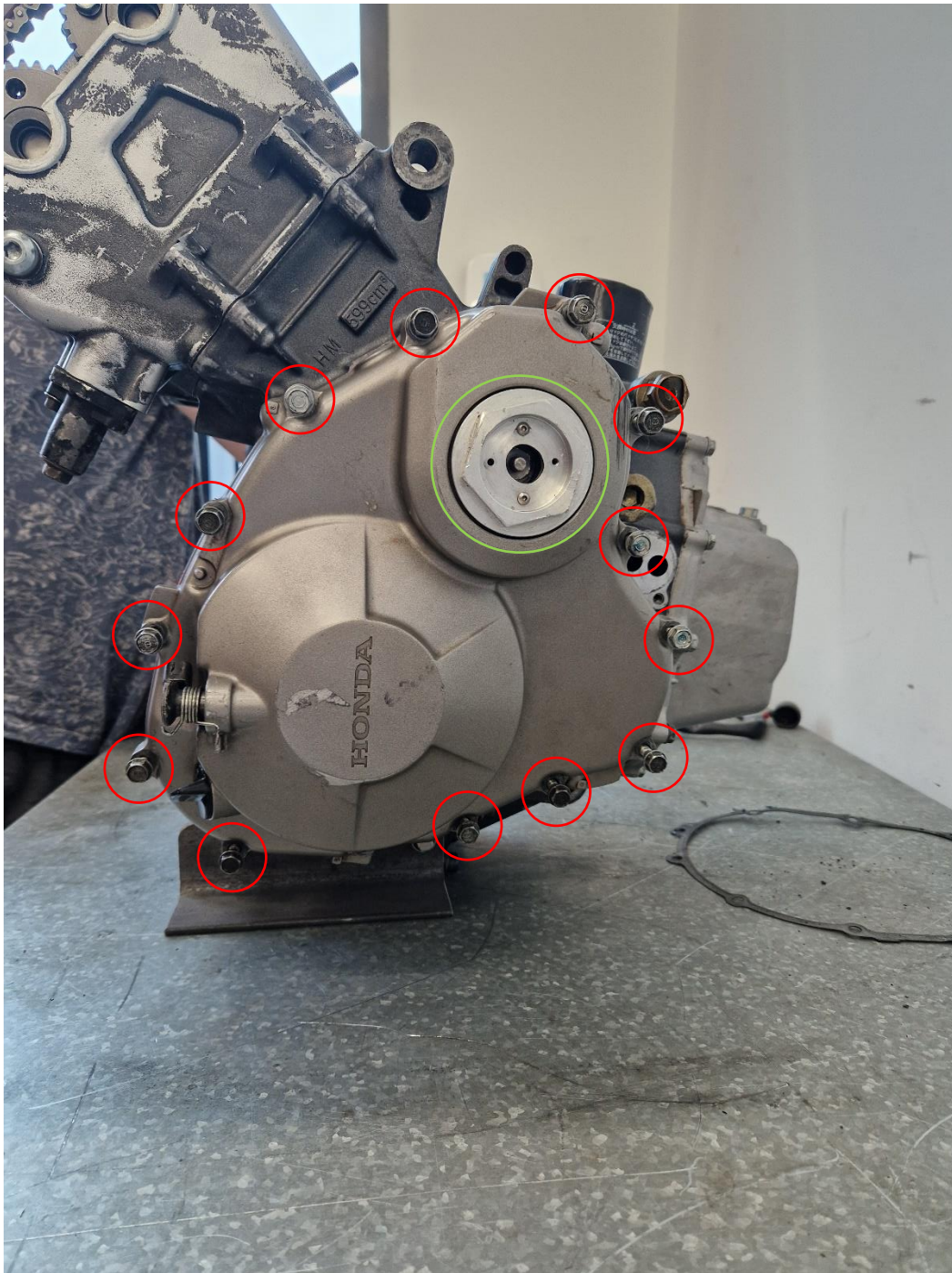


Figure 28: Gearbox casing bolts circled red. Timing cover circled green.



Figure 29: Timing mark on engine casing (red circle) and on engine internals.

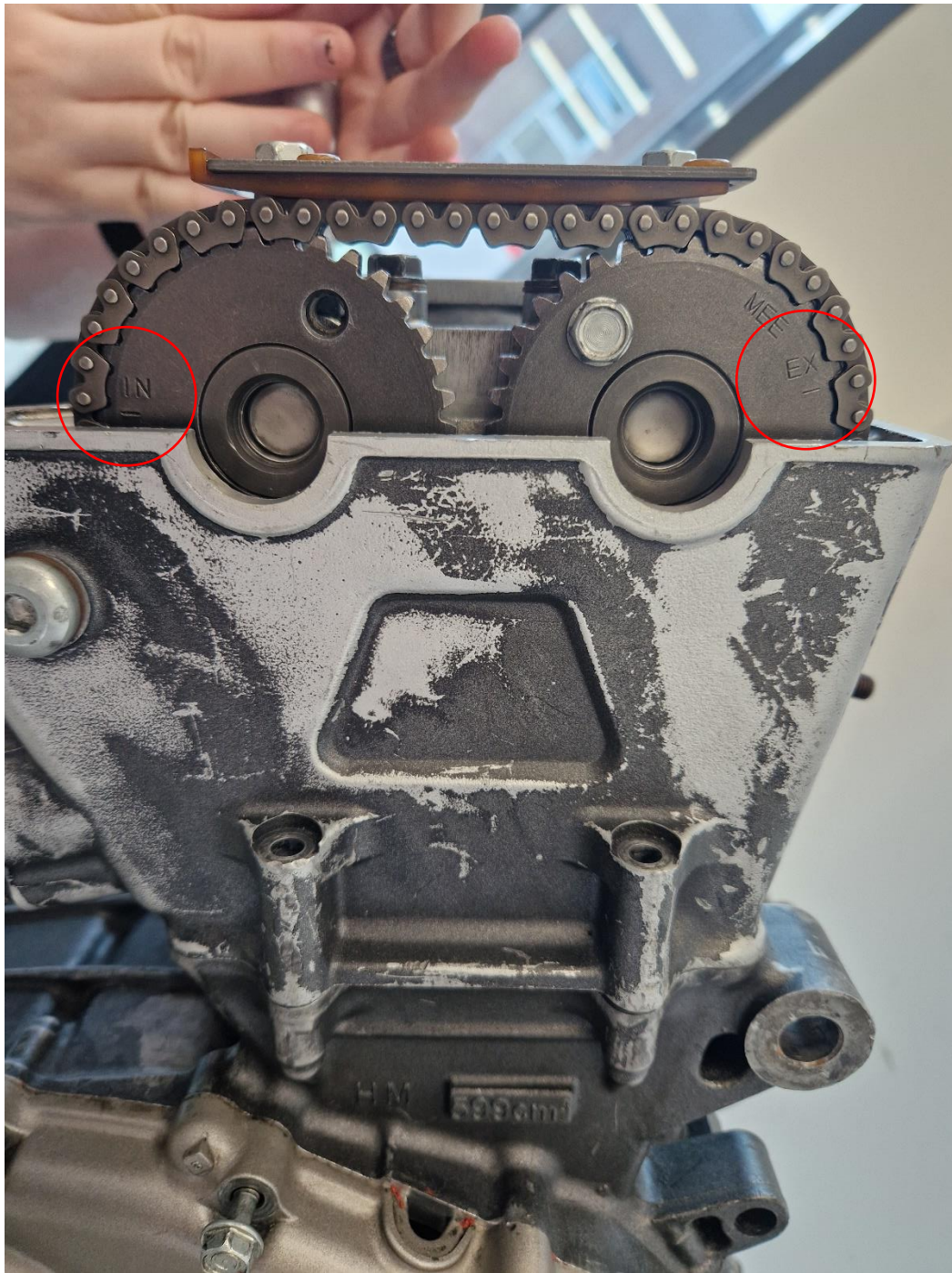


Figure 30: Intake and exhaust timing marks circled red.

6.3 Valve Train & Head Removal

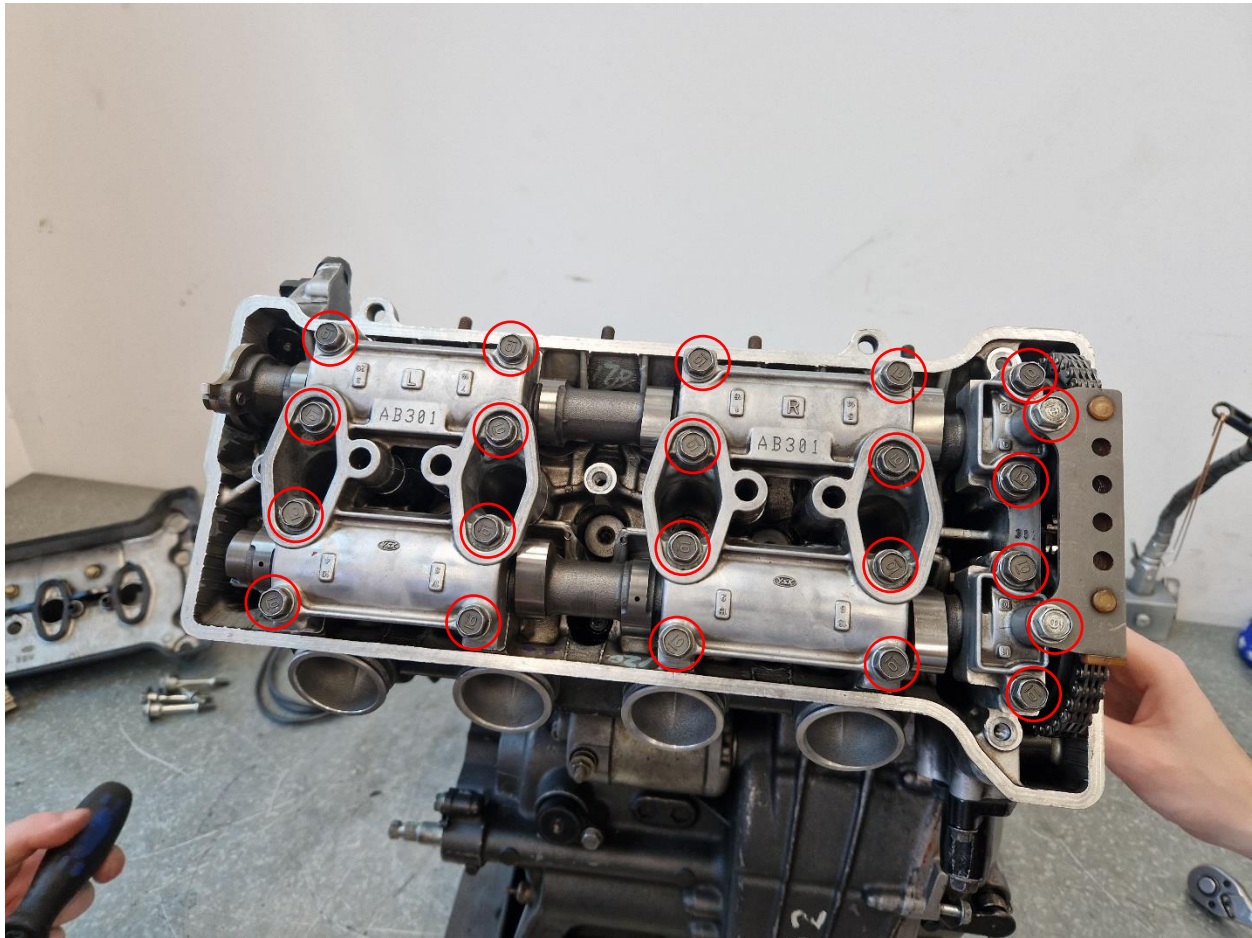


Figure 31: Cam shaft securing bolts circled red.

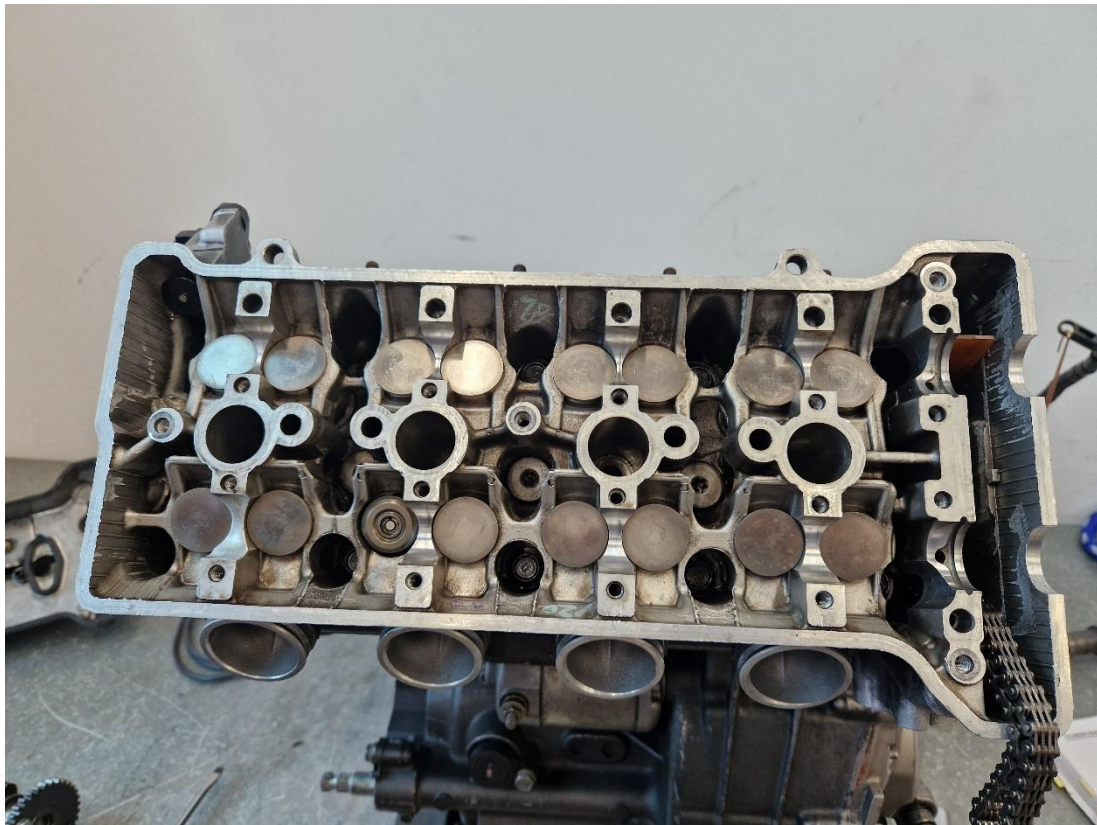


Figure 32: Cam shafts removed.

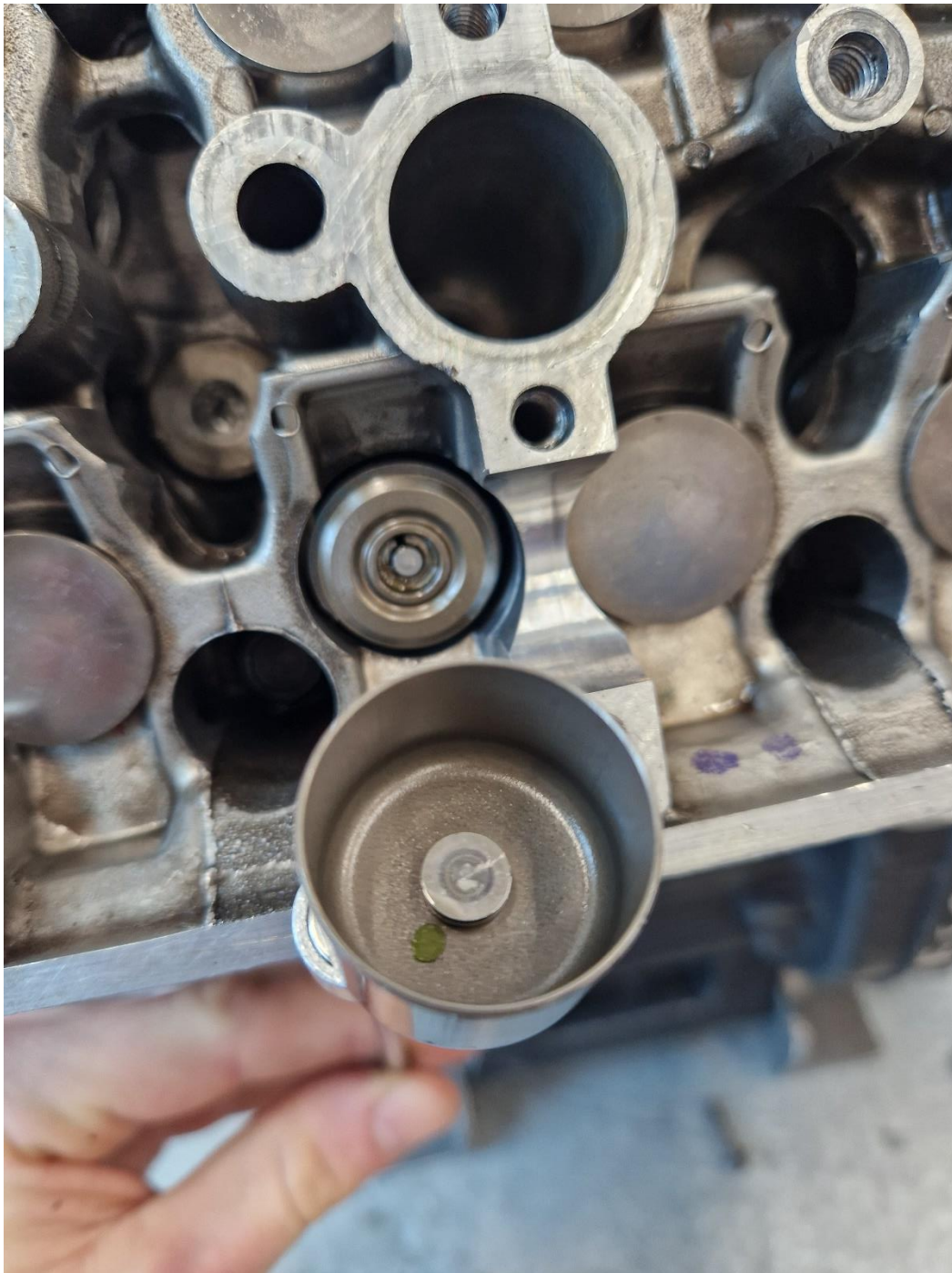


Figure 33: Valve bucket removed showing shim stuck to the inside.

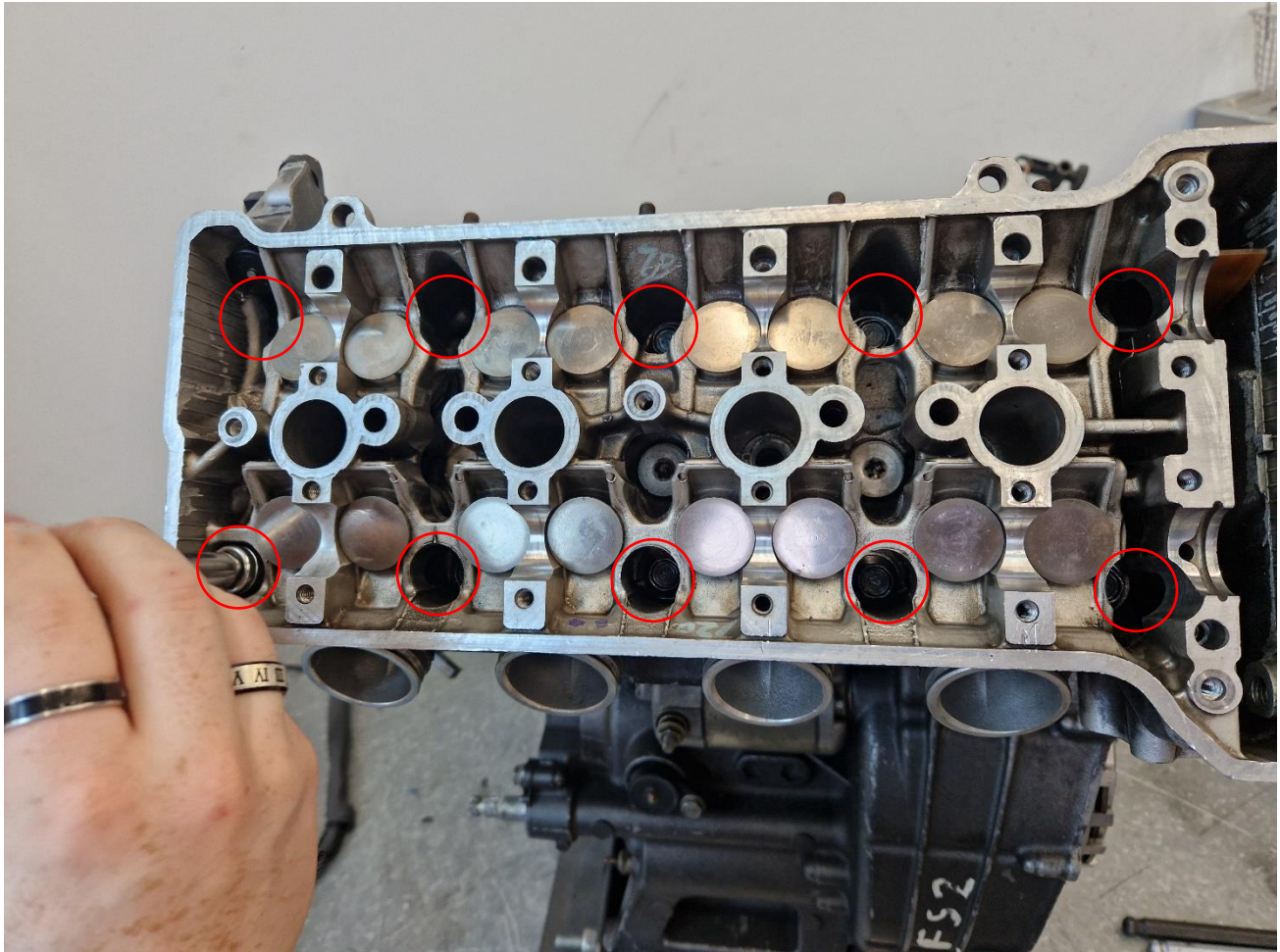


Figure 34: Head bolts circled red.

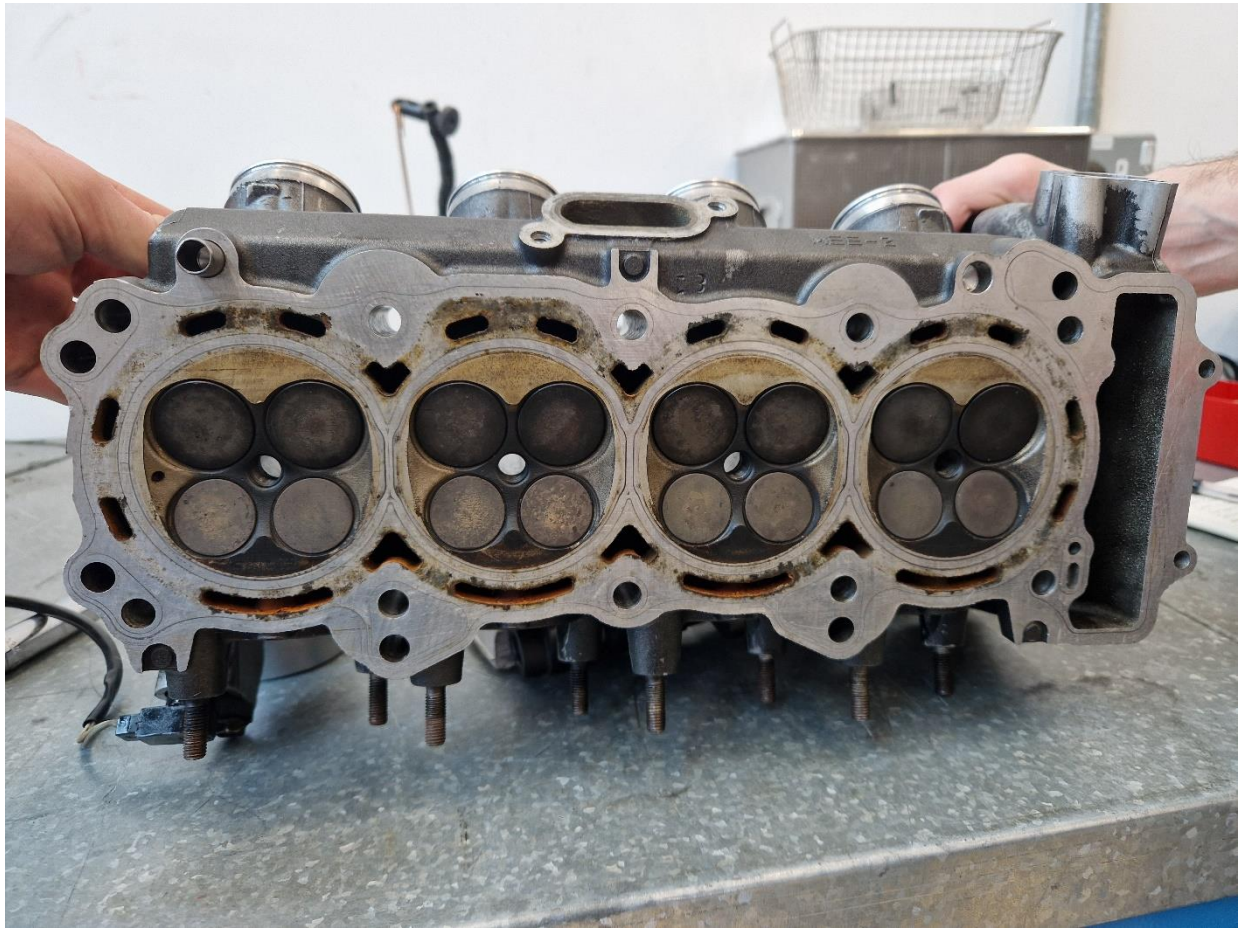


Figure 35: Underside of head.



Figure 36: Pistons and cylinders.

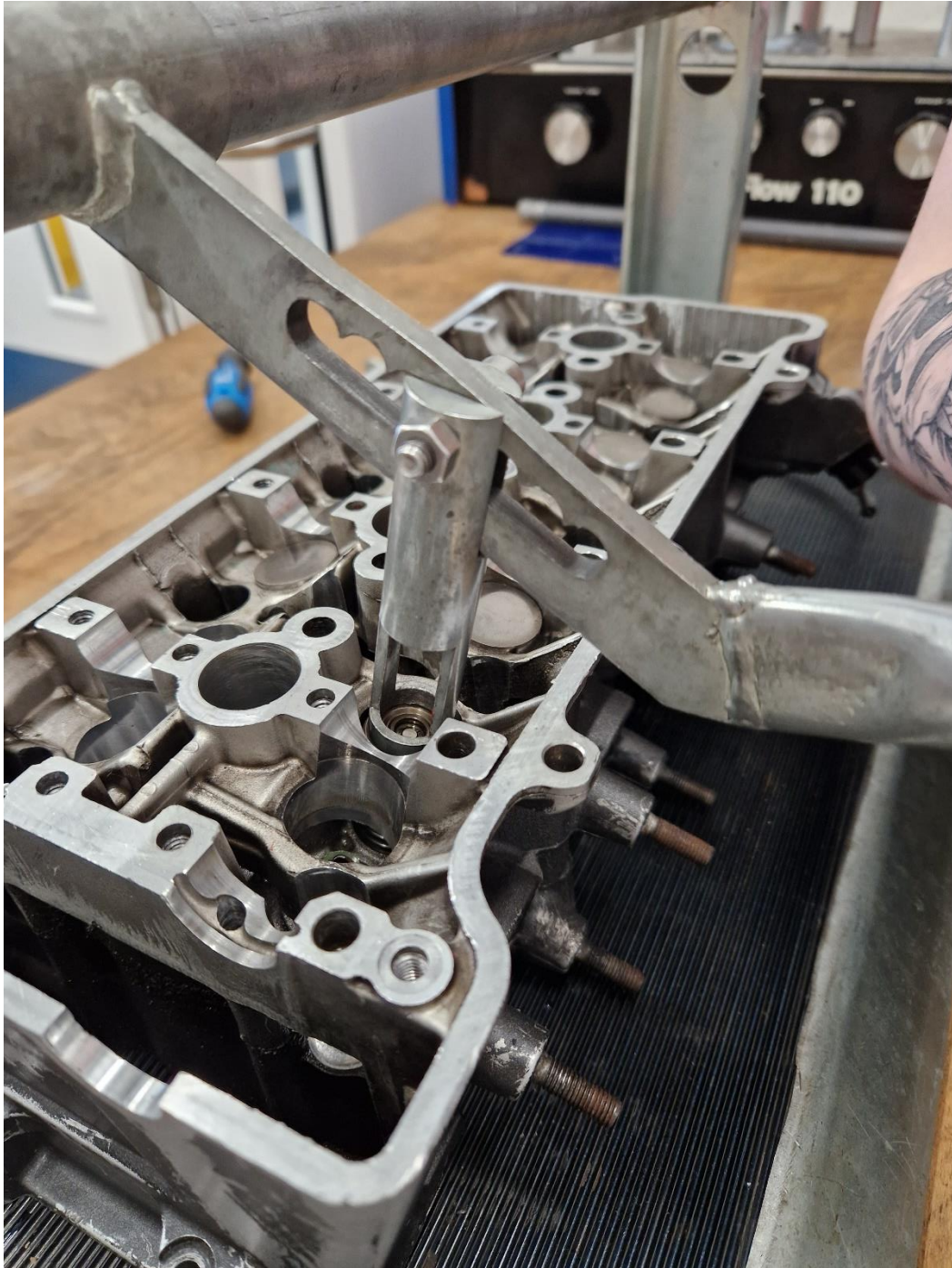


Figure 37: Valve spring compressor.



Figure 38: Using a telescopic magnet to remove valve collets whilst spring is compressed.



Figure 39: Cylinder 4 right hand side exhaust valve components.

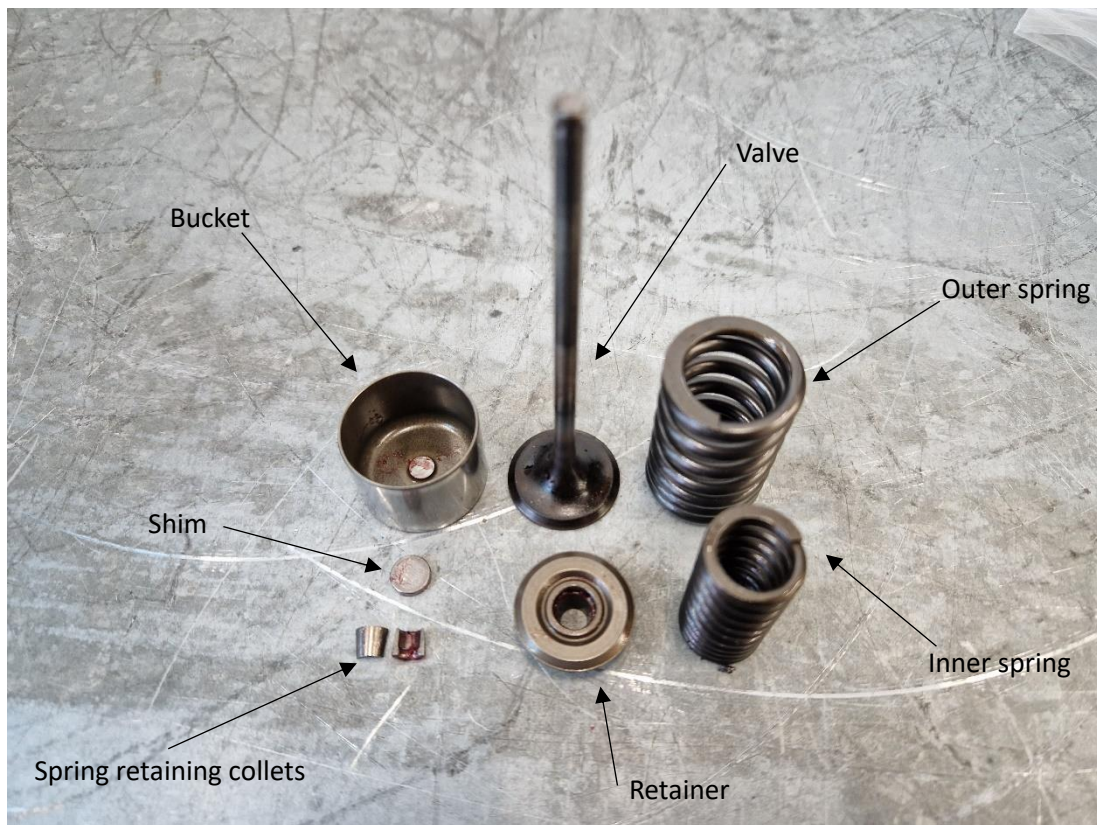


Figure 40: Exhaust valve components.

7 Engine Workshop Session 2 – Sump, Piston and Con Rod Removal

7.1 Sump Removal



Figure 41: Sump bolts circled red.

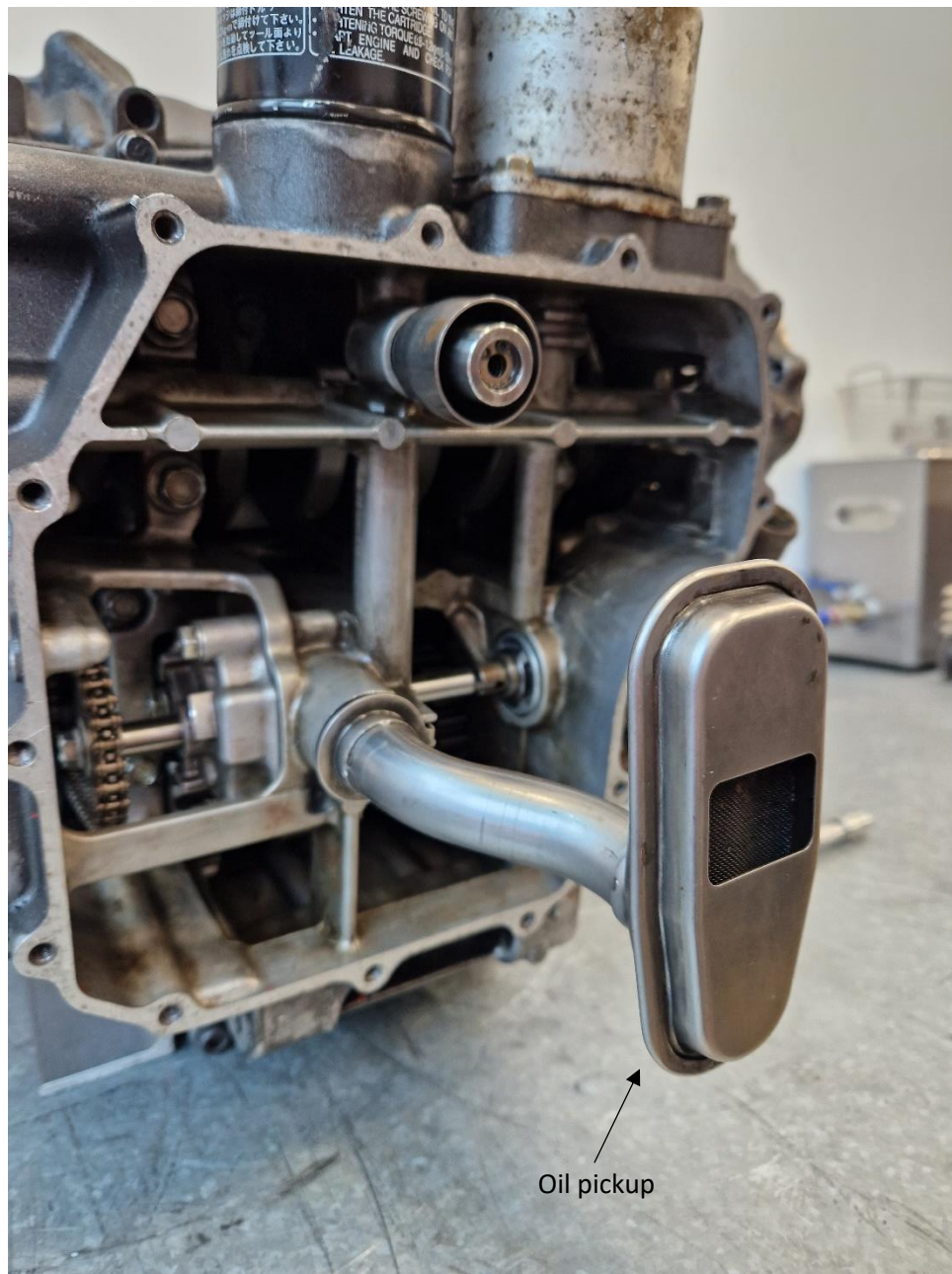


Figure 42: Bottom end internals.

7.2 Piston & Con Rod Removal

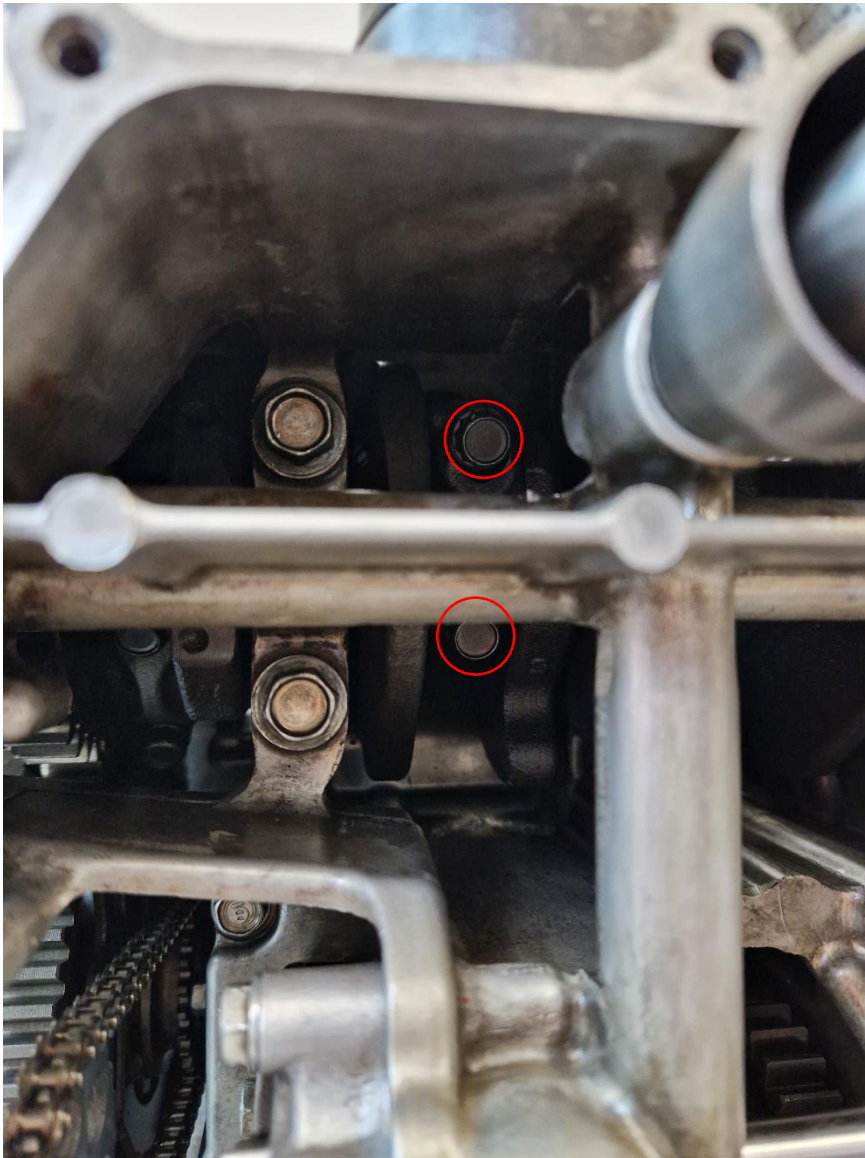


Figure 43: Two big end cap bolts circled red.

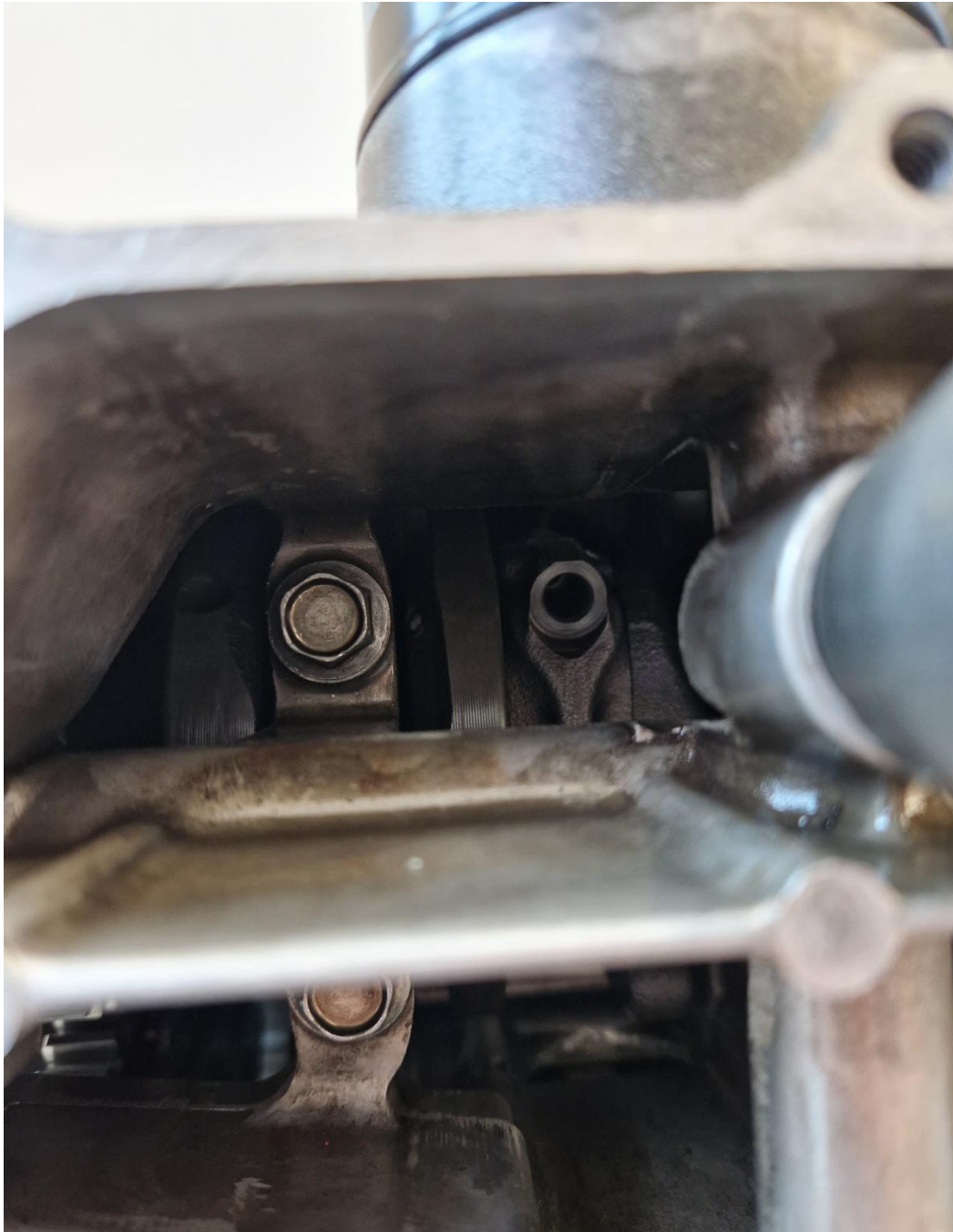


Figure 44: Big end cap with bolts removed.



Figure 45. Big end cap removed.



Figure 46: Big end bearing insert removed.



Figure 47: Piston sitting above casing.



Figure 48: Piston and con rod assembly.



Figure 49: Piston rings.



Figure 50: Three oil holes fed from scrape ring circled red.

8 Engine Workshop Session 3 – Measuring & Tolerancing

8.1 Main Crankshaft Journal

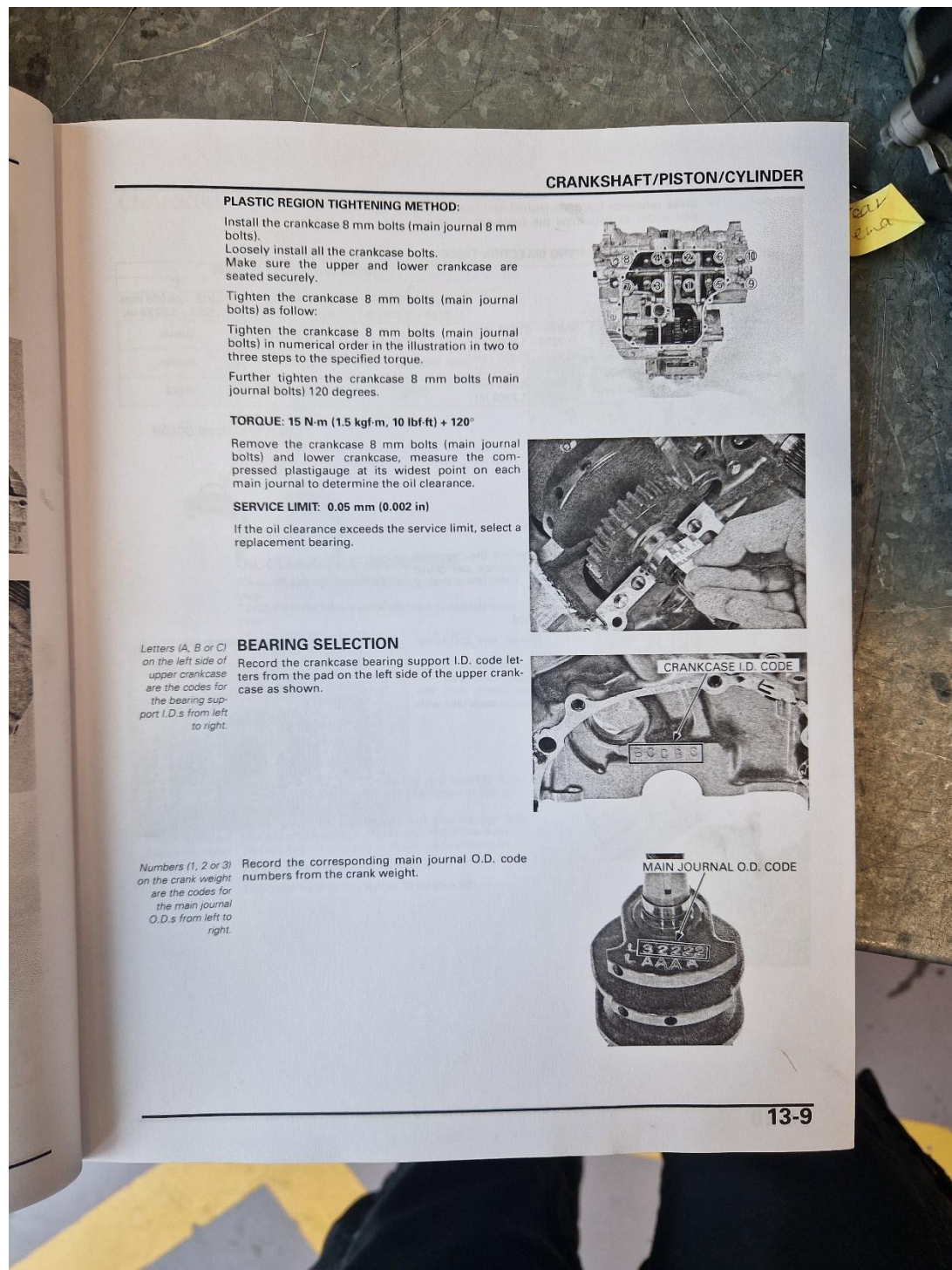


Figure 51: Main journal diameter coding.

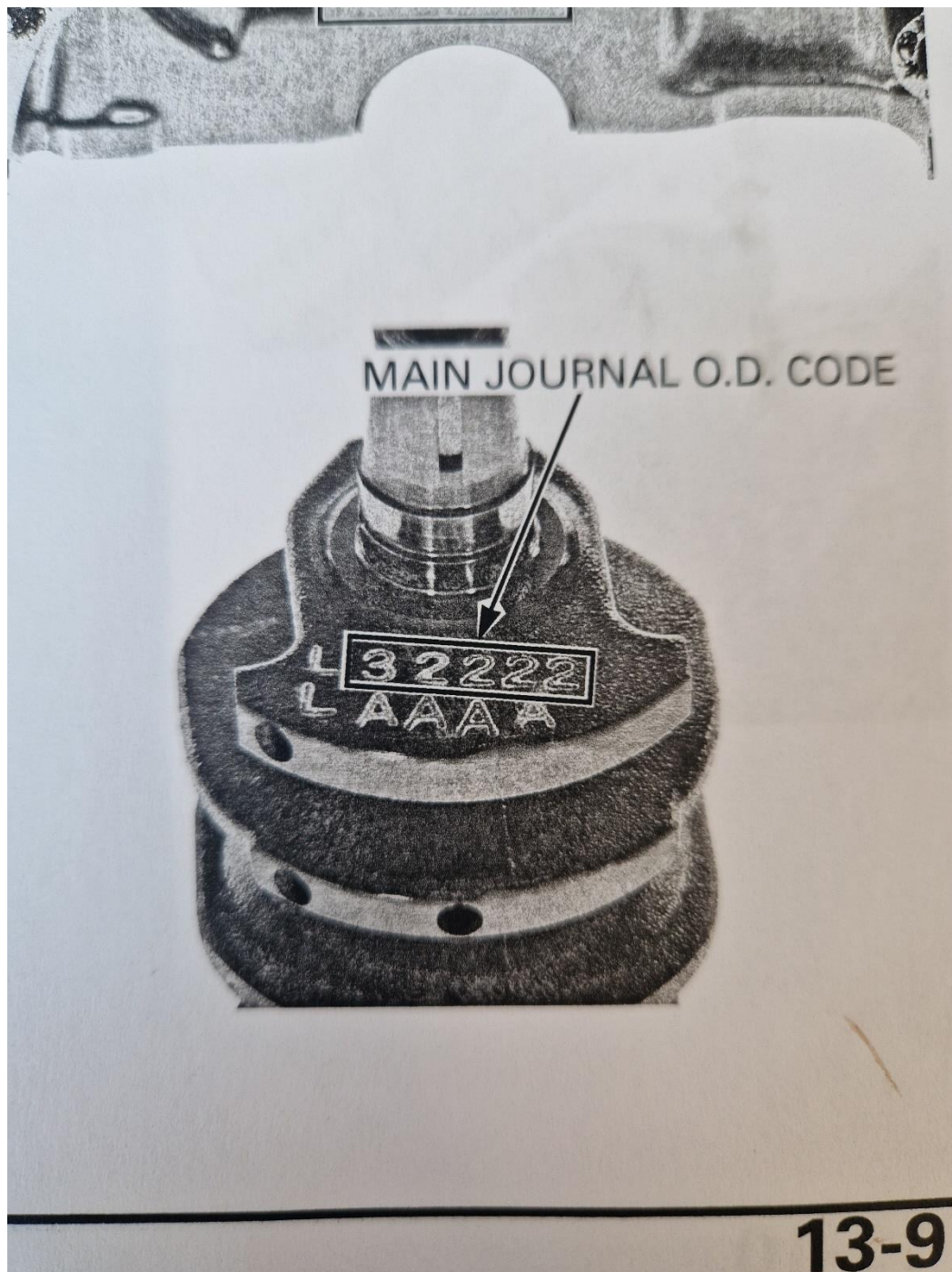


Figure 52: Stamped code on main journal.

8.2 Crankshaft Big End Con Rod Journal

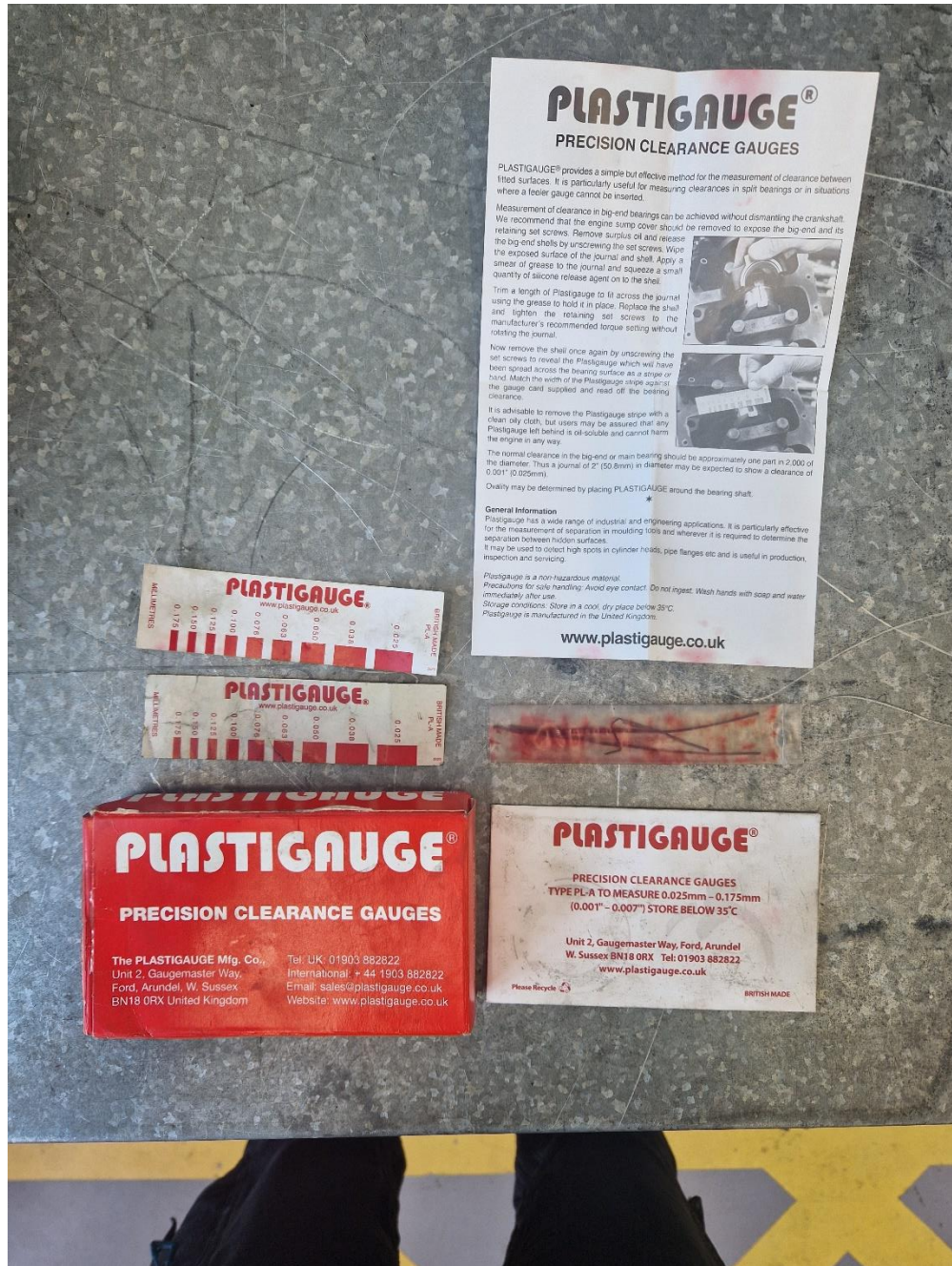


Figure 53: Plastiguage.



Figure 54: Plastiguage secured to big end of conrod.



Figure 55: Measuring plastiguage.

8.3 Inlet/Exhaust Valve Head



Figure 56: Inlet/exhaust valve head.

8.4 Valve Stems



Figure 57: Micrometer measuring valve stem.

8.5 Cylinder Bore

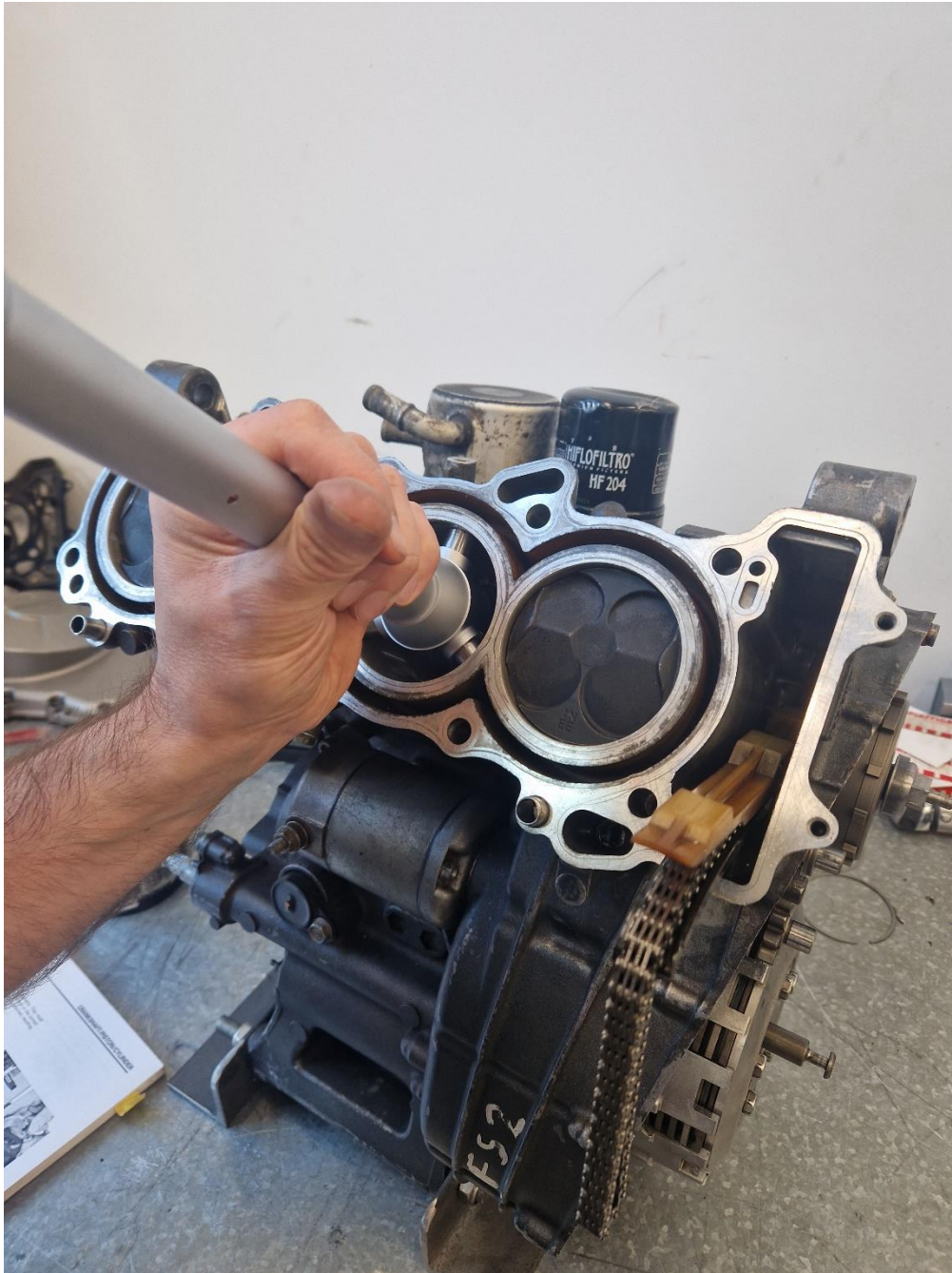


Figure 58: Bore micrometer measuring cylinder.

8.6 Piston Crown & Skirt



Figure 59: Front to back measurement of piston crown.



Figure 60: Side to side measurement of piston crown.



Figure 61: Piston skirt measurment.

8.7 Inner/Outer Valve Springs

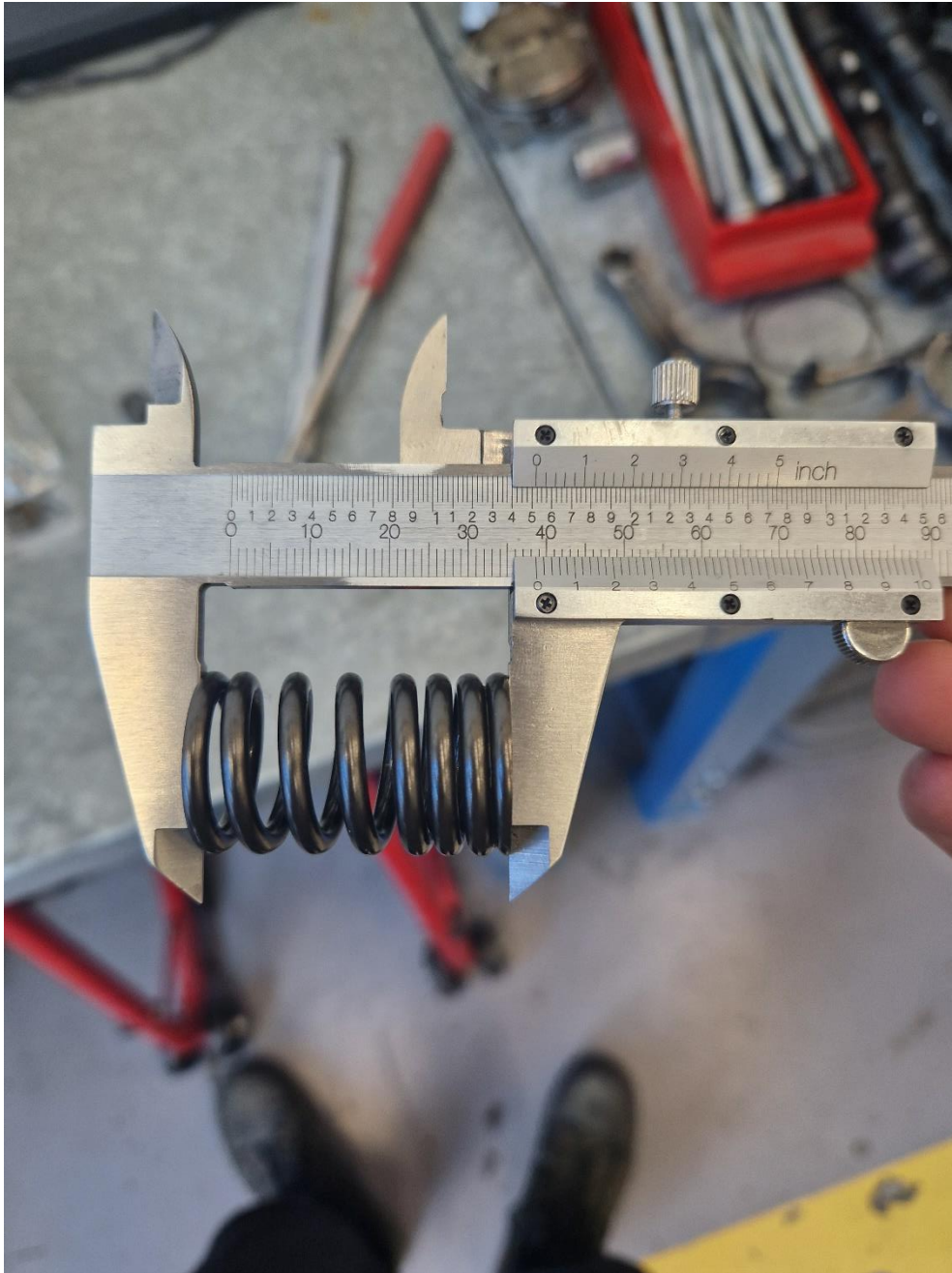


Figure 62: Outer valve spring.

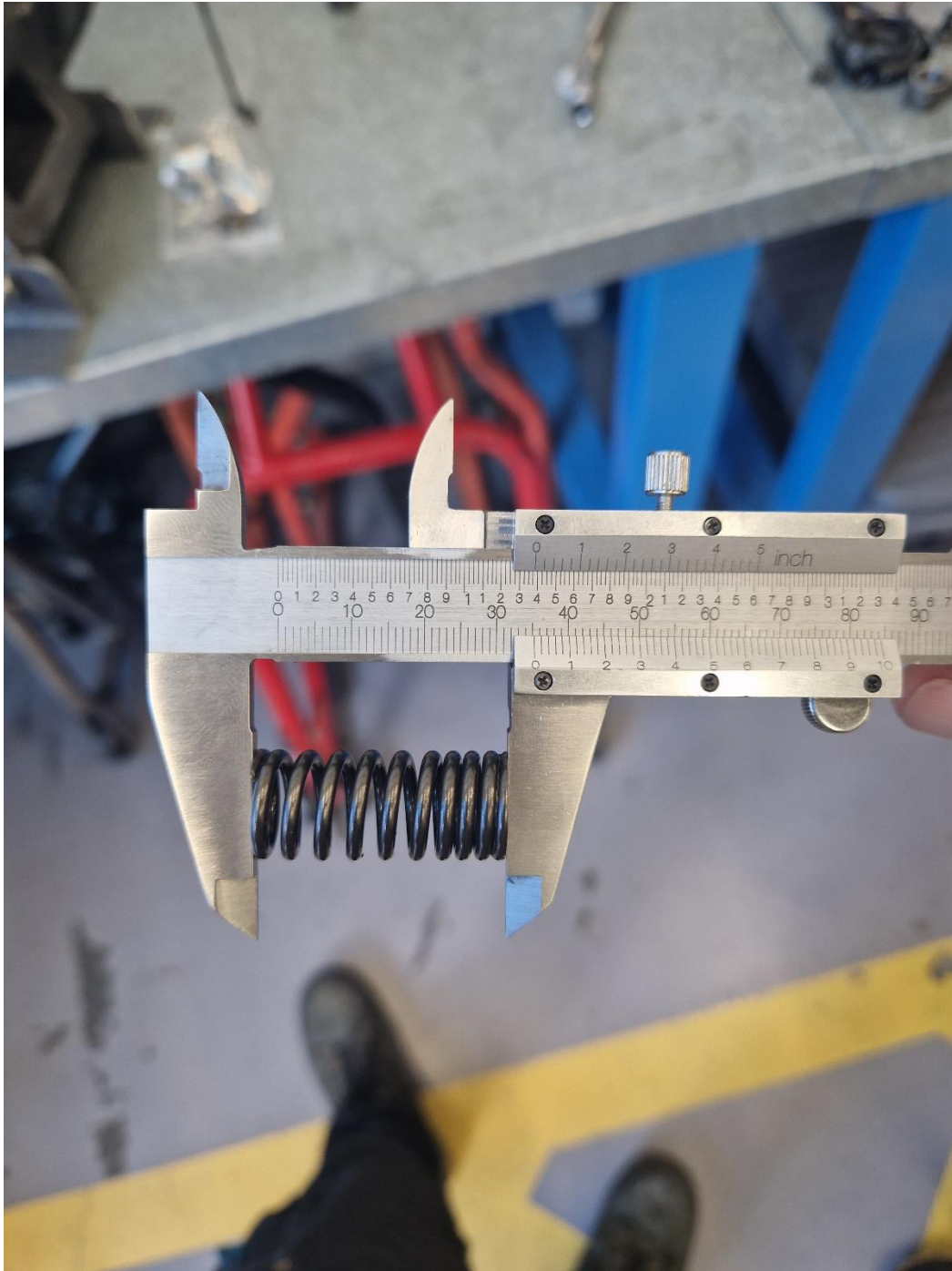


Figure 63: Inner valve spring.

8.8 Cam Bearing



Figure 64: Cam bearing measurement.

8.9 Cam Lift



Figure 65: Cam lobe base measurement.

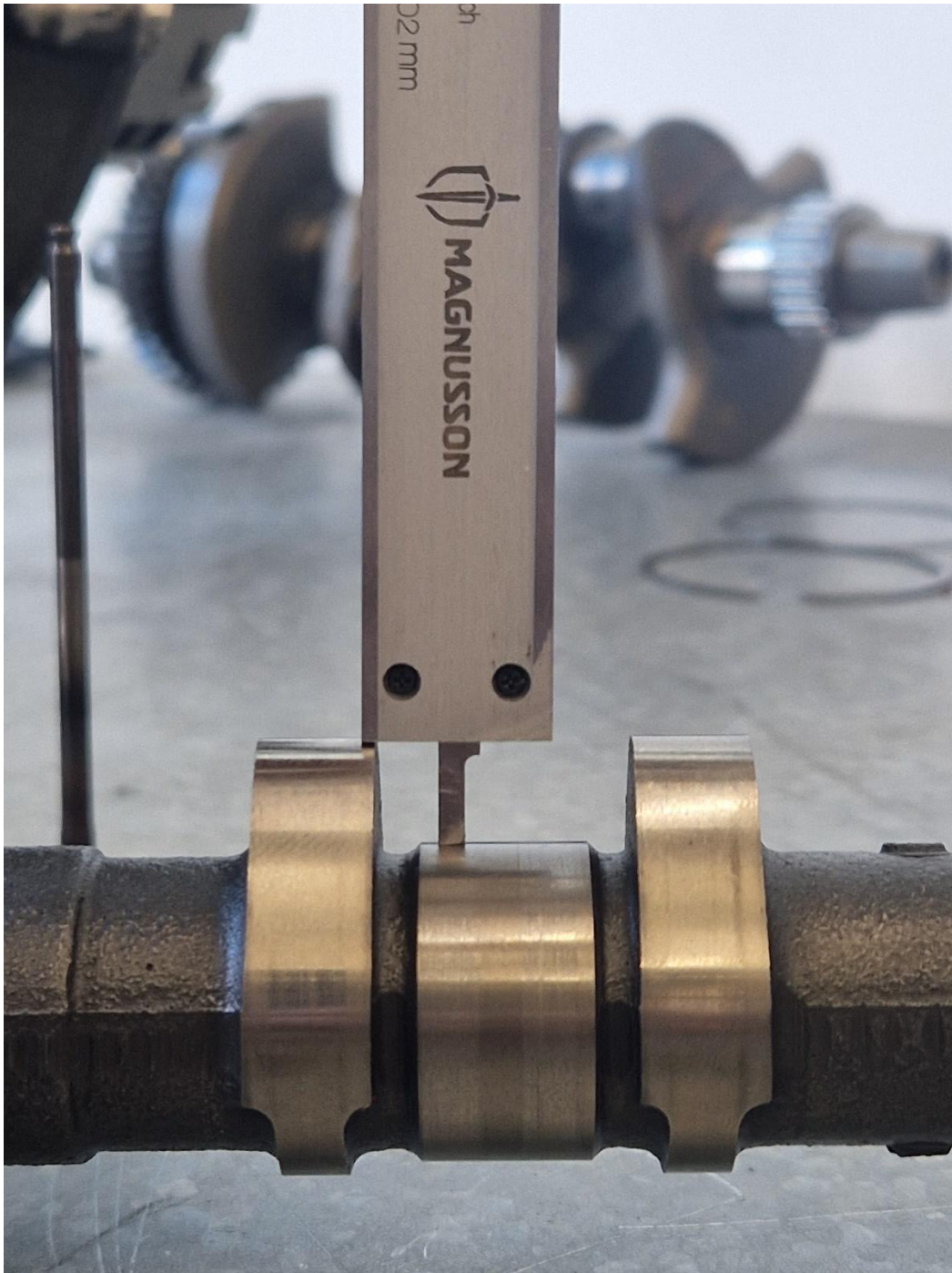


Figure 66: Cam lobe top measurement.

9 Piston Assy & Sump Installation

9.1 Piston Assembly Installation



Figure 67: Piston ring compressor.



Figure 68: Installing piston.

9.2 Sump Installation

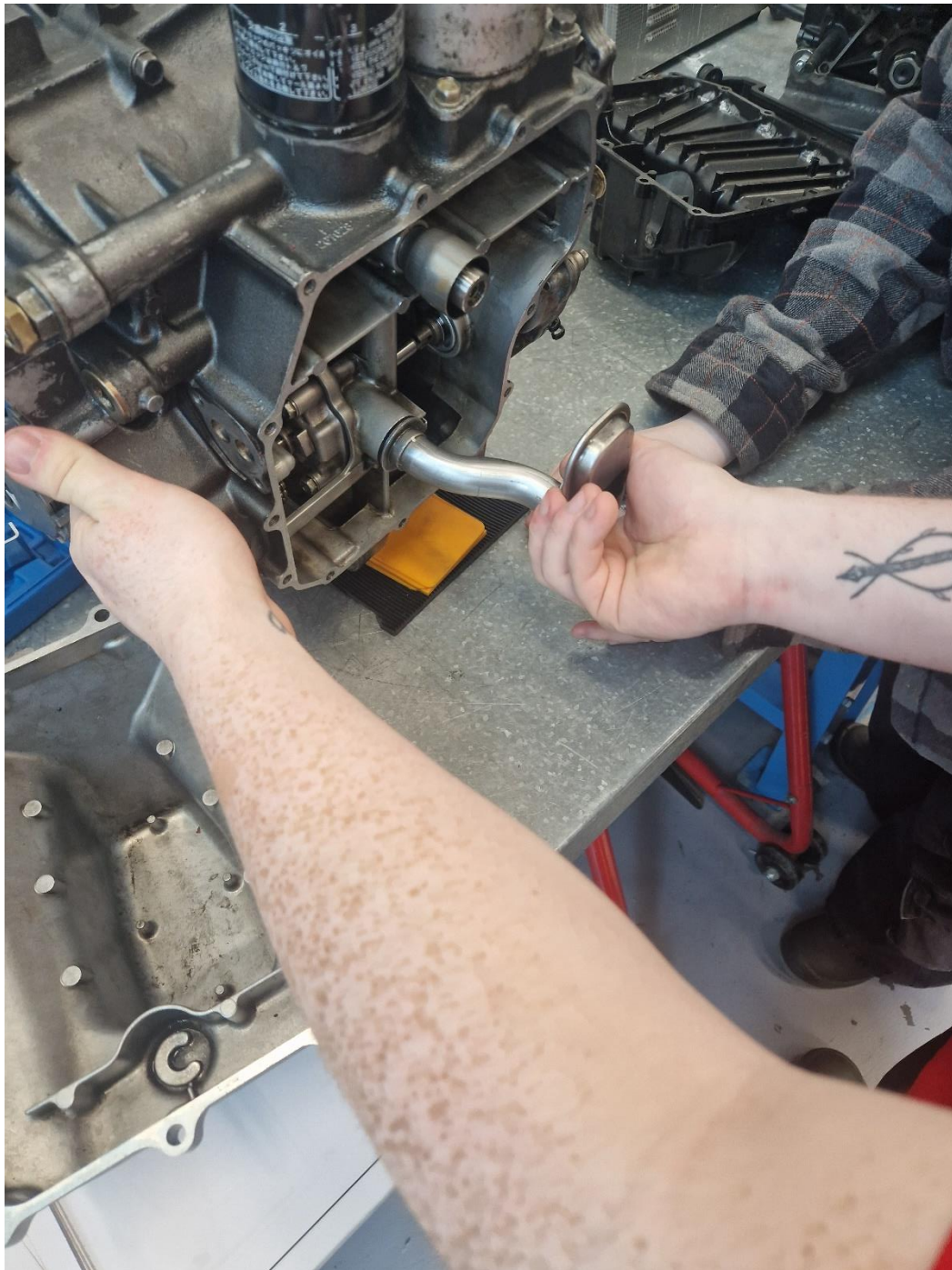


Figure 69: Oil pickup pipe installation.



Figure 70: Sump pan installation.

9.3 Reinstall Valve Components

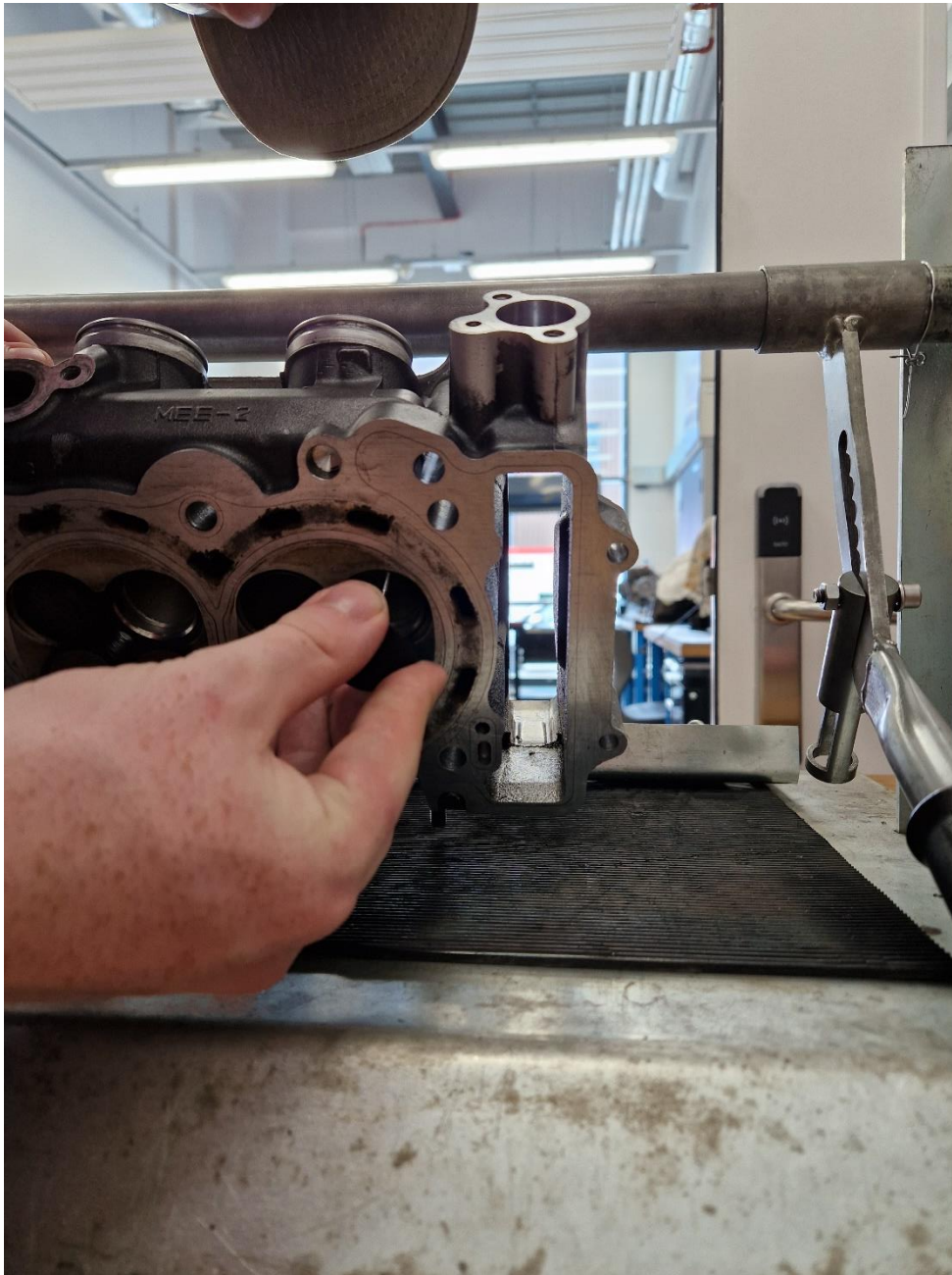


Figure 71: Reinstall valve.

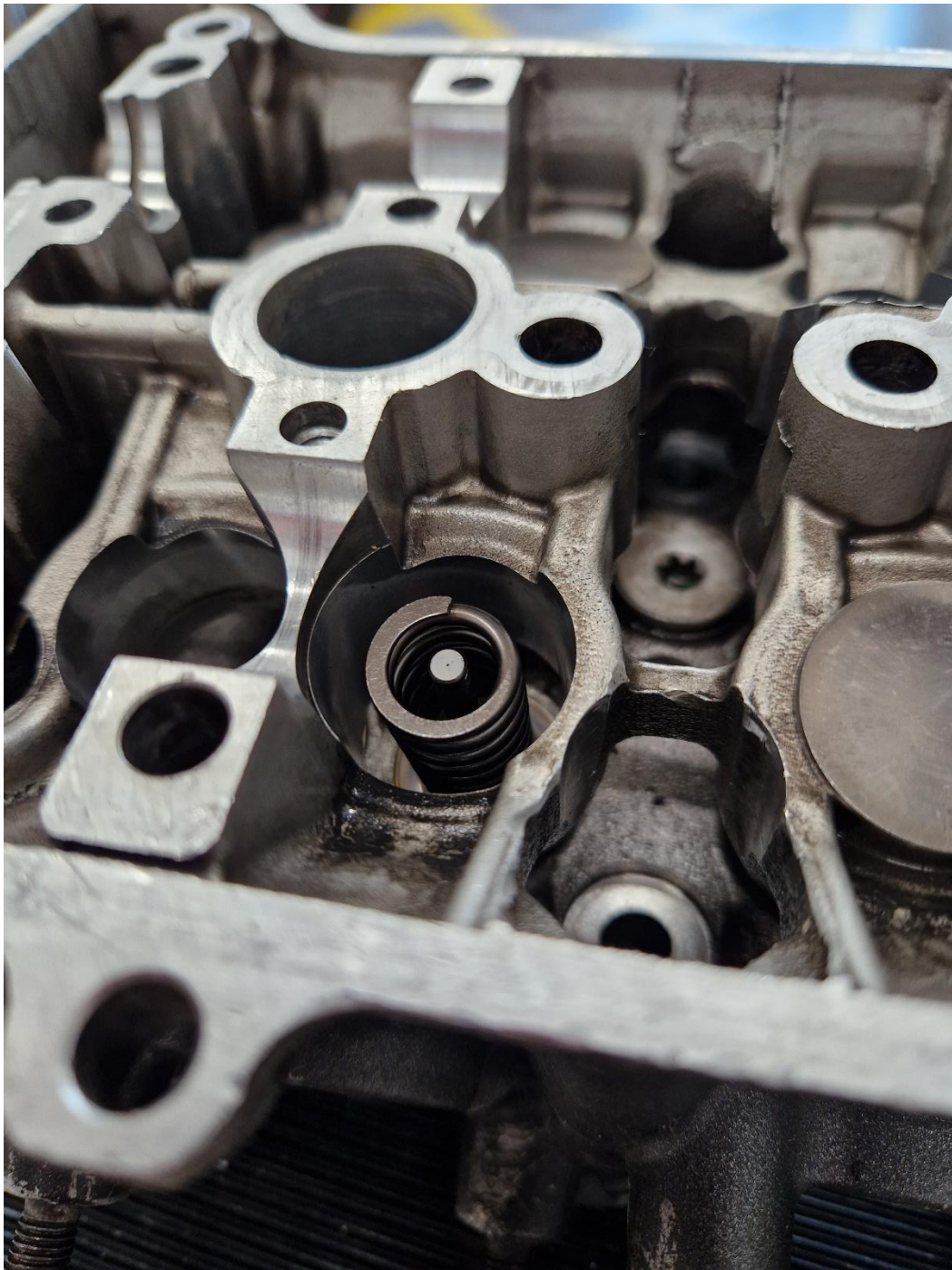


Figure 72: Inner valve spring.

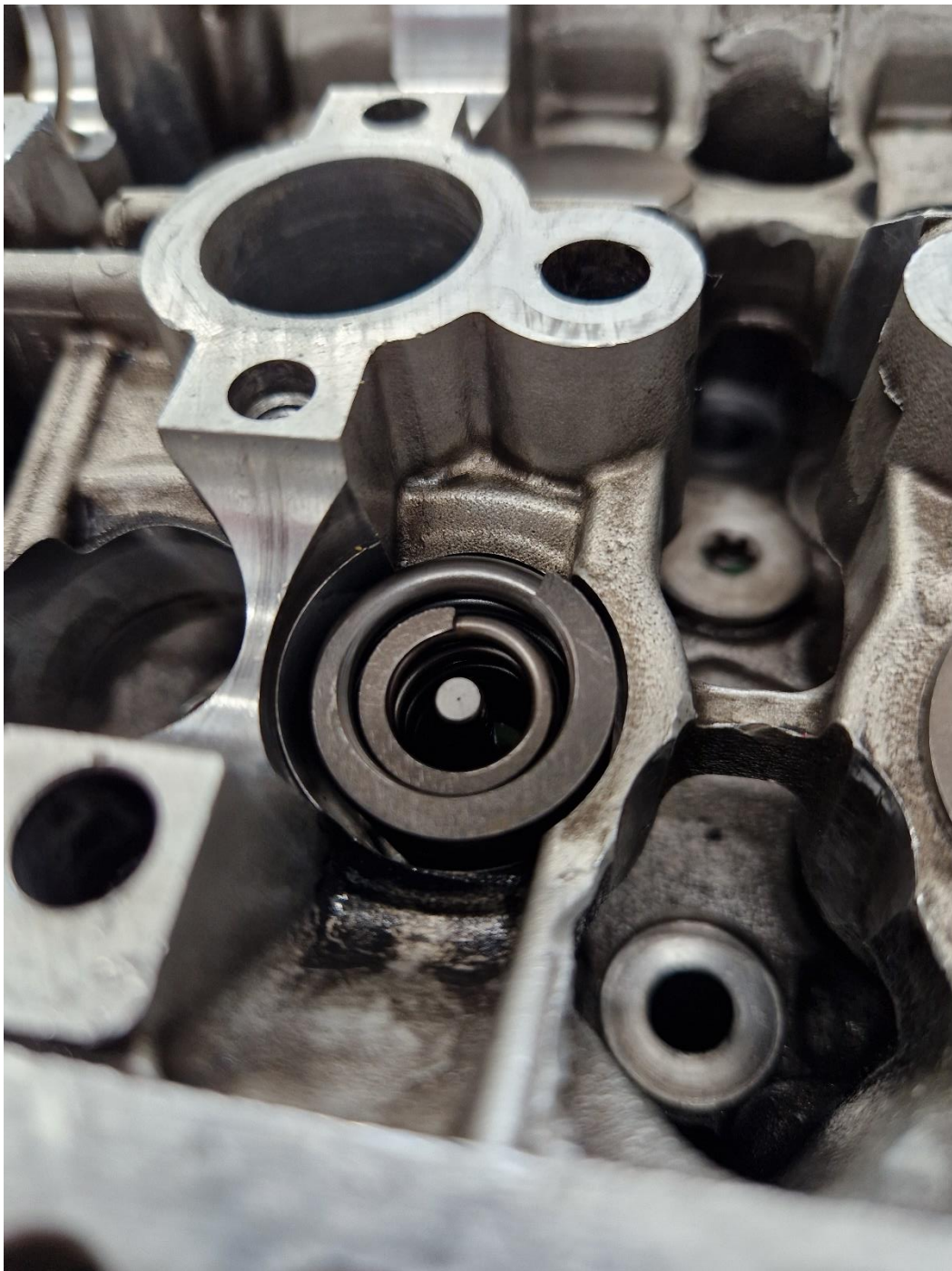


Figure 73: Outer valve spring.



Figure 74: Valve spring retainer.



Figure 75: Valve retaining collet on magnetic screwdriver.



Figure 76: Installing collet.



Figure 77: Ensuring collets have seated correctly.

10 Workshop Health and Safety Overview



Figure 78: Workshop induction.

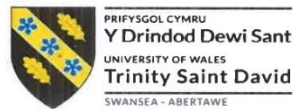


Health & Safety Guidelines

An engineering workshop can be a dangerous environment. Therefore, it is essential that you obey and comply with the following advice in order to minimise the risk to yourself and others who share the workshop facilities with you.

1. Eye protection must be worn in the workshop whenever using any equipment that demands it. This not only applies to any individuals using the equipment but should also include any personnel in the near vicinity. i.e. any personnel in the vicinity of someone using a lathe, grinder etc. (Eye protection is provided).
2. Protective clothing, such as a dust coats or overalls along with steel toe cap footwear must be worn while in the workshops.
3. All students are required to behave in a mature, sensible manner (no horse play etc.)
4. Food and drink must not be consumed in the workshop.
5. The workshops are prohibited to any persons under the influence of alcohol or drugs.
6. Persons under medication or suffering from conditions which may affect their ability to operate machinery should inform their course tutor before entering the workshop.
7. All students wishing to use the workshops must first have attended a general workshop induction session and be aware of the fire escapes and fire assembly points.
8. Push button emergency stops are situated at various points around the workshops. In an emergency, pressing any one of these buttons will stop all power to any machinery. Be aware of the locations of the emergency stops in your workshop.
9. Before commencing work, be sure to apply barrier cream or gloves to your hands. At the end of each session soap should be used to remove grease, oil and coolants. A replenishing cream should then be applied to moisturise the hands after cleaning.
10. It is mandatory that students wishing to use any machine or apparatus must, in the first instance, gain instruction on the use of that particular machine or apparatus and will be in possession of the relevant signed induction document, verifying competency.
11. Loose clothing, jewellery, long hair and hooded top pull cords are particularly hazardous when working near machinery. Loose clothing should be tucked away, jewellery removed and long hair tied back or made safe. The wearing of personal stereo headphones in the workshop environment is a particularly dangerous practice.
12. Personal possessions such as coats and bags must be placed in an approved location where they will not present a hazard to others using the facilities.

Figure 79: H&S workshop guidelines (page 1).

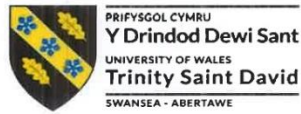


13. Any faults, problems or damage caused or encountered when using any hand tools, equipment or machinery must be reported to a member of staff as soon as they are caused or discovered. (It is a learning environment so it is expected that certain breakages will occur such as tool tips etc.).
14. Any spillages on the floor such as oil, grease or coolant must be reported to a member of staff immediately.
15. If at any time you are unsure of the safe use of hand tools, equipment or machinery approach a member of staff and ask for further advice.
16. Students should make themselves aware of the first aid facilities within the workshops.
17. In the event of an accident or injury, the person involved must report the incident to a member of staff immediately.
18. At the end of every session it is essential that the workshop areas, any machines and equipment used are thoroughly cleaned.

Specific guidance on the use of individual machines and equipment will be provided within the workshop area concerned when appropriate.

General Workshop Induction Health and Safety Procedure Signoff Must Be Completed On Line

Figure 80: H&S guidelines (page 2).



Machine Shop IQ021a Milling Safety Rules

A milling machine can be a dangerous machine. Therefore, it is essential that you obey the following advice in order to minimise the risk to yourself and others who share the machine shop facilities with you.

1. Loose clothing, jewellery, long hair and hooded top pull cords are particularly hazardous when working near machinery. Loose clothing should be tucked away, jewellery removed and long hair tied back or made safe. The wearing of personal stereo headphones in the workshop environment is a particularly dangerous practice.
2. Keep hands and face away from all moving parts.
3. Stop the machine before handing the workpiece.
4. Never lean on a machine.
5. Keep the mill bed and guides clear.
6. Stop the machine before changing feeds and speeds.
7. Keep hands away from swarf.
8. Any spillages on the floor such as oil, grease or coolant must be reported to a member of staff immediately.
9. Wear eye protection whenever in close proximity to the mill.
10. Always use the guarding before operating a mill.
11. Please inform a member of staff before using any equipment if you suffer from any condition or are taking any prescription medication which may affect your ability to operate machinery.
12. Do not operate a mill under the influence of alcohol or drugs.
13. Use barrier cream before and soap after operating a lathe. A replenishing cream should then be applied.
14. If you are not sure, ask a member of staff if the lathe is in good working order before use.
15. Do not use a machine without staff supervision.
16. Always switch off a mill before leaving it unattended, even for a short period.

Figure 81: Machine shop milling H&S (page 1).



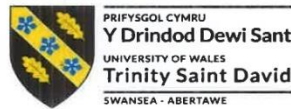
17. Any faults, problems or damage caused or encountered when using a lathe or any of the associated equipment must be reported to a member of staff as soon as they are caused or discovered.
18. Ensure that you know the position and operation of each and every control, before operating a mill. All milling machines have the same fundamental operating principles however, the methods of control may differ.
19. If unsure about the correct depth of cut or speed, for a particular material or operation, ask a member of staff for advice.
20. Always use a minimum projection from vice or clamp for any given operation.
21. It is of paramount importance that persons using the milling machine tightly clamp down the workpiece and or the vice before operation the mill. If your workpiece or vice brakes free, it will turn at the set spindle speed potentially causing damage or injury to anyone who gets in its way.
22. Always seek advice from a member of staff if unsure about the proper and safe use of a machine.

Machine shop Milling Safety Procedure Signoff

The Machine shop Milling safety procedures have been explained to me and I understand their importance and agree to follow the guidance at all times.

Please sign your name: _____
Please print your name: _____
Course: _____
Year: _____
Date: ____/____/____

Figure 82: Machine shop milling H&S (page 2).

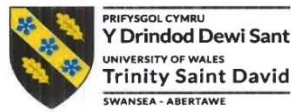


Machine Shop IQ021a Turning Safety Rules

A centre lathe can be a dangerous machine. Therefore, it is essential that you obey the following advice in order to minimise the risk to yourself and others who share the machine shop facilities with you.

1. Loose clothing, jewellery, long hair and hooded top pull cords are particularly hazardous when working near machinery. Loose clothing should be tucked away, jewellery removed and long hair tied back or made safe. The wearing of personal stereo headphones in the workshop environment is a particularly dangerous practice.
2. Keep hands and face away from all moving parts.
3. Stop the machine before handing the workpiece.
4. Never lean on a machine.
5. Keep the lathe bed clear.
6. Stop the machine before changing feeds and speeds.
7. Keep hands away from swarf.
8. Any spillages on the floor such as oil, grease or coolant must be reported to a member of staff immediately.
9. Wear eye protection whenever in close proximity to the lathe.
10. Always remove chuck key after using it to adjust chuck jaws.
11. Always use the chuck guard before operating a lathe.
12. Please inform a member of staff before using any equipment if you suffer from any condition or are taking any prescription medication which may affect your ability to operate machinery.
13. Do not operate a lathe under the influence of alcohol or drugs.
14. Use barrier cream before and soap after operating a lathe. A replenishing cream should then be applied.
15. If you are not sure, ask a member of staff if the lathe is in good working order before use.
16. Do not use a machine without staff supervision.
17. Always switch off a lathe before leaving it unattended, even for a short period.

Figure 83: Machine shop turning H&S (page 1).



18. Any faults, problems or damage caused or encountered when using a lathe or any of the associated equipment must be reported to a member of staff as soon as they are caused or discovered.
19. Ensure that you know the position and operation of each and every control, before operating a lathe. All lathes have the same fundamental operating principles however, the methods of control may differ.
20. If unsure about the correct depth of cut or speed, for a particular material or operation, ask a member of staff for advice.
21. Always use a minimum projection from chuck for any given operation.
22. Ensure the tailstock and dead centre are used whenever possible.
23. Always seek advice from a member of staff if unsure about the proper and safe use of a machine.

Machine shop Lathe Safety Procedure Signoff

The Machine shop Lathe safety procedures have been explained to me and I understand their importance and agree to follow the guidance at all times.

Please sign your name: _____
Please print your name: _____
Course: _____
Year: _____
Date: ____/____/____

Figure 84: Machine shop turning H&S (page 2).

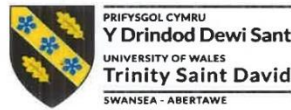


Machine Shop IQ021a Drill Safety Rules

A bench, radial arm or pedestal drill can be a dangerous machine. Therefore, it is essential that you obey the following advice in order to minimise the risk to yourself and others who share the machine shop facilities with you.

1. Loose clothing, jewellery, long hair and hooded top pull cords are particularly hazardous when working near machinery. Loose clothing should be tucked away, jewellery removed and long hair tied back or made safe. The wearing of personal stereo headphones in the workshop environment is a particularly dangerous practice.
2. Keep hands and face away from all moving parts.
3. Stop the machine before handing the workpiece.
4. Keep the machine bed and guides clear from swarf.
5. Stop the machine before changing feeds and speeds. Ensure that instruction has been given and the machine isolated.
6. Keep hands away from swarf.
7. Any spillages on the floor such as oil, grease or coolant must be reported to a member of staff immediately.
8. Wear eye protection whenever in close proximity to the machine.
9. Always use the guarding before operating a machine.
10. Please inform a member of staff before using any equipment if you suffer from any condition or are taking any prescription medication which may affect your ability to operate machinery.
11. Do not operate any machine under the influence of alcohol or drugs.
12. Use barrier cream before and soap after operating a machine. A replenishing cream should then be applied.
13. If you are not sure, ask a member of staff if the machine is in good working order before use.
14. Do not use a machine without staff supervision.
15. Always switch off a machine before leaving it unattended, even for a short period.

Figure 85: Machine shop drill H&S (page 1).



16. Any faults, problems or damage caused or encountered when using a drill or any of the associated equipment must be reported to a member of staff as soon as they are caused or discovered.
17. Ensure that you know the position and operation of each and every control, before operating a machine. All drilling machines have the same fundamental operating principles however, the methods of control may differ.
18. If unsure about the correct depth of cut or speed, for a particular material or operation, ask a member of staff for advice.
19. Always use a minimum projection from vice or clamp for any given operation.
20. It is of paramount importance that persons using the drilling machine tightly clamp down the workpiece and or the vice before operation the machine. If your workpiece or vice brakes free, it will turn at the set spindle speed potentially causing damage or injury to anyone who gets in its way.
21. Always seek advice from a member of staff if unsure about the proper and safe use of a machine.

Machine shop Drill Safety Procedure Signoff

The Machine shop Drill safety procedures have been explained to me and I understand their importance and agree to follow the guidance at all times.

Please sign your name: _____

Please print your name: _____

Course: _____

Year: _____

Date: ____/____/____

Figure 86: Machine shop drill H&S (page 2).