

Agile, Innovative, Motivated precision engineering

A&M offer fast turnaround manufacturing of bespoke high value, low volume components and tooling for many sectors including aerospace and motorsports.

In 60,000 square foot of manufacturing space, we specialise in machining complex precision components in materials from thermoplastics to aluminium, stainless steel and exotic materials such as Inconel and Titanium.

Pure Precision engineering solutions for demanding sectors:

Aerospace, Automotive, Formula 1, Motorsport, Food production tooling, Press tooling, space and marine components, UAV engine systems.

- **UK's largest commercial EDM Spark and Wire erosion sub-contractors – 36 EDMs**
- **Tool making design and manufacture, rapid repairs to production equipment**
- **Design for Manufacture and machining capabilities – 40 CNC machining milling and turning centres**
 - 3,4 & 5-axis Milling, Turning
 - Grinding, Fabrication, Laser Welding
 - Metrology Inspection - 4 CMMs
 - 3D laser scanning for retro engineering
 - Additive manufacturing, 3D printing
 - CAD programming and development

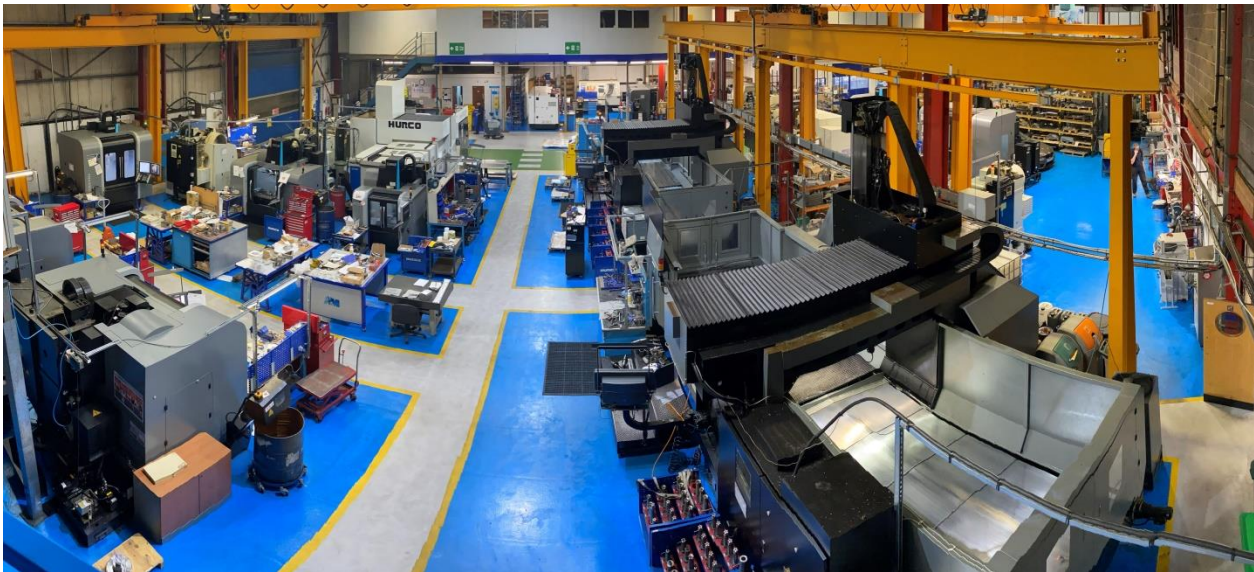
Accreditations

- Quality Management AS9100 / BSEN9100
- NADCAP Aerospace AS7003
- Electro Discharge Machining ISO 9001
- Environmental Management ISO 14001:2015
- Thrive at Work Bronze Wellbeing award

Customers come to us with a challenge, we find a solution

AGILE | INNOVATIVE | MOTIVATED

CNC Precision Engineering



A&M offers an extensive range of precision Hurco CNC milling centres with 3, 4, 5-Axis and high-speed capabilities.

Our largest CNC mill has a capacity of 3200 x 2100 x 920 mm and can take up to 11 tons in weight.

Our fast production turnaround times deliver precision component manufacturing to meet customer demands.

We have a dedicated Hurco trained maintenance engineer in-house delivering preventative maintenance and ensuring all machines are calibrated for optimum performance.

<u>CNC Millers</u>	<u>X/Y/Z axis</u>	<u>Manufacturer details</u>
<u>3 Axis</u>		
HURCO DCX22 40T	2200 x 1700 x 750 mm	https://www.hurco.com/en-us/products/3-axis/Pages/VM-3-Axis-mills.aspx
HURCO DCX32 50T (x2)	3200 x 2100 x 920 mm	
HURCO VM 1	660 x 356 x 457 mm	
HURCO VM 10i	660 x 406 x 508 mm	
HURCO VMX 30i (x5)	762 x 508 x 610 mm	
HURCO VMX 30S	762 x 508 x 610 mm	
HURCO VMX 42 (x3)	1060 x 610 x 610 mm	
HURCO VMX 84Ti	2134 x 860 x 760 mm	

HURCO BX60i 3-axis double column high speed machining	1600 x 1300 x 700 mm	http://www.sodick.org/products/high-speed-milling/hs430l.html
Sodick HS4 30L	420 x 350 x 200 mm	
4 Axis HURCO VM3	1200 x 450 x 450 mm	
5 Axis HURCO DCX3226HT-Si	3200 x 2600 x 1300mm	https://www.hurco.eu/products/portal-machining-centers/double-column-5-axis-machining-centers/dcx-3226-ht-5-si/
HURCO VMX 42Ui (x6)	762 x 508 x 520 mm	
HURCO VMX 60 SRTi (x2)	1066 x 610 x 610 mm	
HURCO VMX 84 SWi	1524 x 660 x 610 mm 2134 x 865 x 762 mm	

<u>High Speed Milling</u>	X/Y/Z axis	Manufacturer details
Sodick HS 430L	420 x 350 x 200 mm	http://www.sodick.org/products/high-speed-milling/hs430l.html
Sodick UH 650L (x2)	620 x 500 x 300 mm	https://sodick.com/product/uh650/

<u>Manual Milling</u>	X/Y/Z axis	Manufacturer details
XYZ 1500	660 x 305 x 406 mm	http://www.xyzmachinetools.com/
XYZ 2000	750 x 380 x 406 mm	
XYZ EMX 2000 Part CNC Pro trac	750 x 380 x 406 mm	
XYZ EMX 3000 Turret Part CNC Pro trac	810 x 430 x 406 mm	
Bridgeport Manual		

<u>CNC Turning lathes</u>	X/Y/Z axis	Manufacturer details
HURCO TM6 VDi	178 x 356 mm	https://www.hurco.com/en-us/products/lathes/Pages/TM-cnc-lathe-machine.aspx https://www.mazakeu.co.uk/machines/quick-turn-250my/ http://www.xyzmachinetools.com/
HURCO TM8 VDi (x2)	203 x 508 mm 203 X 550 mm	
HURCO TM8i	250 x 750 mm	
HURCO TM10 VDi (x2)	305 x 1,016 mm	
HURCO TM12i	234 x 626 mm	
MAZAK 250MY		
XYZ Proturn SLX 555	500 x 200 mm	
XYZ Proturn 1630	1000 x 420 mm	

<u>Conventional Turning</u>	X/Y/Z axis	Manufacturer details
XYZ Manual turner	500 x 200 mm	http://www.xyzmachinetools.com/ https://www.machmt.co.uk/product/64/mach-l-1340
Mach Machine Tools Manual Lathe L-1340	1250mm between centres 235 X 120mm	
Optimum OD420	1500 mm	

Electrical Discharge Machining (EDM)

Our latest Sodick equipment includes green technology to reduce power consumption, the eroders shut down as soon as the job is completed, helping us to meet Environmental Management System ISO 14001:2015.

EDM Spark Erosion



Spark eroding is a specialist skill and A&M has specialist engineers with over 100 years cumulative experience, enabling us to provide bespoke spark erosion solutions to create large, long or irregular shapes. Spark EDM allows work on very small pieces where the pressure of conventional cutting tools could damage the part.

- Our largest spark cutting dimension is 1200 x 650 x 500 mm and 5 tons in weight.
- Our machines give us the flexibility to use SYSTEM 3R and EROWA work holding systems.
- Facility to tool change up to 15 stations, for multi-feature sparking in one operation.
- All our spark eroders offer the capability for multi-axis cutting in all three axes simultaneously for complex jobs.

Sodick Spark Eroders	X/Y/Z axis travel	Manufacturer details
AQ35	350 x 250 x 270 mm	
AG60L (x5) 4 standard, 1 8 Axis	600 x 420 x 370 mm	https://www.sodick.org/products/die-sinking-edm/ag60l.html
AL60 G (x2)	600 x 420 x 370 mm	https://sodick.com/product/al60g/
AG80L (x2)	850 x 520 x 420 mm	http://www.sodick.org/products/die-sinking-edm/ag80l.html
AG100L	1200 x 650 x 500 mm	http://www.sodick.org/products/die-sinking-edm/ag100l.html
EDM Hole Drilling		
K1C hybrid	200 x 300 x 300 mm	http://www.sodick.org/products/hole-drilling-edm/k1c.html
K1C CNC	200 x 300 x 300 mm	
K1C (x2)	200 x 300 x 300 mm	
Anotronic River 600 EDM fast hole drill machine	600 x 400 x 400 mm	https://anotronic.co.uk/machine-sales/edm-fhd/river-600-2/

EDM Hole Drilling is used to create cooling holes, producing a film of cold air which sits on the surface of blades, stopping them from melting.

- We can use electrodes from 0.3mm to 3mm in diameter
- Up to 350mm in Z height
- CNC operated option with capacity for pieces up to 300 x 200 x 300mm
- A manual Bridgeport miller enabling us to hold large workpieces
- We use copper electrodes to fast hole drill multiple work pieces in materials such as inconel or titanium.

EDM Wire Erosion

In Wire-Cut EDM, a thin single-strand metal wire is fed through the work piece, which is in a submerged tank of dielectric fluid or deionized water. This fluid helps to cool the process and flush away the cut material. The Wire EDM process uses electric current to cut conductive materials leaving a smooth surface that requires no further finishing or polishing.



<u>Sodick Wire Eroders</u>	X/Y/Z axis	Manufacturer details
AG600L (x 5)	700 x 500 x 400 mm	http://www.sodick.org/products/precision-wire-edm/ag600l.html
ALC 600G (x 8) 1 with 8 Axis	600x 400 x 350 mm	http://www.sodick.org/products/precision-wire-edm/alc600g.html
AQ325L	350 x 250 x 220 mm	
AQ537	750 x 500 x 400 mm	http://www.sodick.org/products/precision-wire-edm/aq750l-premium.html
AQ750L Premium (x 2)	600 x 400 x 300 mm	https://www.sodick.com/products/wire-edm/aq900l
AQ900L Premium	900 x 600 x 400 mm	
AQ1200L	1200 x 800 x 400 mm	

Metrology Coordinate Measuring Machines and quality inspection

Quality assurance and quality control are critical to our manufacturing process.

We have a climate-controlled metrology room and testing equipment to ensure we consistently manufacture to the micron specific tolerances our OEM customers require.



<u>Metrology measurement</u> <u>Coordinate Measuring Machines (CMM)</u>	Capacity
<p>Hexagon Global Performance 12.30.10 with Leitz scanning head Technology https://www.hexagonmi.com/products/coordinate-measuring-machines/bridge-cmms/global-s</p> <p>Aberlink Axiom Too https://www.aberlink.com/en-gb/products/cmm/axiom-too-cnc/</p> <p>Aberlink project X Advanced Shop Floor Vision measuring system https://www.aberlink.com/en-gb/products/vision-measurement-system/project-x/</p> <p>Mitutoyo CRYSTA-Apex V CMM (x 3) https://shop.mitutoyo.co.uk/web/mitutoyo/en_GB/mitutoyo/CRYSTA-APEX%20S900%20Series/CRYSTA-Apex%20V500%2C%20700%2C%20900%20Series/index.xhtml</p>	<p>1200 x 3000 x 1000 mm</p> <p>600 x 1000 x 400 mm</p> <p>400 x 300 x 125 mm</p> <p>500 x 400 x 400 mm</p>

Quality Inspection & Testing equipment

3D Handheld Laser scanner - HandySCAN 700 3D

<https://www.creaform3d.com/en/metrology-solutions/portable-3d-scanner-handyscan-3d>

Analyser - Hitachi Vulcan handheld XRF LIBS laser analyser

<https://hha.hitachi-hightech.com/en/product-range/products/handheld-xrf-libs-analysers/handheld-libs-analysers>

Digimar 817 CLM Height Measuring Instrument

<https://www.mahr.com/en/Services/Production-metrology/Products/Digimar---Height-Gages/Digimar-817-CLM---Height-measuring-instrument/>

Digital Bore Micrometres - Mahr, Mititoyo

Digital Imagery Measurement for small and delicate parts – Keyonce 7000, Project X, Aberlink

Dynamic Balancing Machine to less than 1g.mm

Dynascopes - Vision Engineering, Digimax DX1 Micro Height

Hardness testing equipment - Zwick Roell ZMU

Injector Tester and ultra-sonic cleaner – ASNU

Keyence IM 7000 Image Dimension Measuring System

https://www.keyence.co.uk/landing/lpc/lp_ppc_im_measurementdevice.jsp?aw=googleUKinfo0070059&gclid=EAlaIQobChMI8s33nI3S4gIVg53VCh0MsAmoEAAAYASAAEgLbwvD_BwE

- Up to 100 simultaneous measurements performed in seconds to a repeatability of +/-0.1 microns.

Mahr MarSurf M 310 Mobile Surface Roughness Measuring system

<https://metrology.mahr.com/en-int/products/article/6910260-mobiles-rauheitsmessgeraet-marsurf-m-310>

Micro height gauge - Sylvac Hi-Cal 300

<https://www.sylvac.ch/download-en/manuals/height-gauges/height-gauge-hi-cal>

Microscopes - Mantis Elite, Photonic PL2000

Metrios HD cross inspection

Allows shopfloor parts to be measured in seconds.

<https://www.metrios.com/en/measuring-systems.php>

Renishaw XL-80 laser calibration <http://www.renishaw.com/en/xl-80-laser-system--8268>

High performance measurement and calibration for motion systems, including CMMs and machine tools.

Shadowgraphs

- Mitutoyo PH3500
- Starrett 400
- Mitutoyo PH-A14 shadowgraph

Linear glass scales & touch screen M2 geometric measurement display.

https://www.mitutoyo.com/Images/retrofit_ph-A14-pkgs.pdf

Surface Testers - Mitutoyo S-400, Mitutoyo SJ400

Non-Destructive Testing (NDT) undertaken by registered approved suppliers

<p><u>Welding, Fabrication</u></p>	<p>Our fabrication shop is well equipped, taking full advantage of a large 3 x 2 metre bespoke Jig and fixture table and the latest MIG & TIG welders from Miller.</p> <p>We have a portable laser which we can use at customer sites and traditional welding equipment, a welding bay and trained operators.</p>
<p><u>Laser</u> Alpha laser Alflak 500</p> <p>Rofin Integral Rofin Select Rofin Star Laser Weld Tool Open</p> <p><u>Manual</u> Mig, Tig and Arc welders</p> <p>Box & Pan Folder Morgan Rushworth 2 mm</p>	<p>http://alphalaser.com/product/alflak/</p> <p>Spot welds using a galvo head to deflect the beam, and seam welds using overlapping spots or with a continuous beam. https://www.rofin.com/en/products/systems-and-solutions/manual-welding-lasers/performance/</p> <p>Standalone portable system, enabling laser welding at a customer's site.</p> <p>Up to 2mm bending thickness capacity and a maximum bending length of 2000mm. The counter balance weights assist performing bends https://www.morganrushworth.com/productlist/morgan-rushworth-bpc-counterbalance-box-pan-folders/</p>

Other equipment

Finishing / Deburring

Acton Centrifugal High Energy Finishing Machine

<https://acton-finishing.co.uk/machinery/centrifugal-high-energy/>

Walther Trowal TFM 83/37 vibratory finishing machine, cleaning trough

<https://www.walther-trowal.com/uk/produkte/mass-finishing-technology/trough-vibrators>

Grinding

Surface grinding

A rotating abrasive wheel removes material and creates a flat surface, used on different types of steel and other metals.

8 Surface Grinders, up to 1000 x 500 x 400mm capacity including

Okamoto 63 DXV

Okamoto ACC-105 GX

<https://okamoto-europe.de/en/acc-gx-series/>

Andmar YSG 1640 Surface Grinder with attached crane up to 500 kg

https://www.andmar.co.uk/ysg-ts-machines-1224-1640_p310

Cylindrical grinding

9 Cylindrical grinders used on shafts, punches and Camshafts

Bandsaw – vertical, Addison V2812 <https://addisonsaws.co.uk/products/addison-jubilee-v2812-f-h>

Cranes – 4 cranes up to 10 tonnes

Drills – Pedestal drills x 3, Radial drills x 2

Honing – Delapena SpeedHone EAS Honing from 1mm to 80mm diameter, to tolerance of 1 micron

Part Marking – Dot matrix, Laser, Chemical

Power Saws – 3x horizontal, 1 band saw

Rotary drill

Shot Blasters – dry and wet

Try out Press – up to 150 tonnes

Ultrasonic cleaners – EMX 2000 & 3000, manual MCS

CAD CAM Software

Autodesk PowerMill Ultimate 360

<https://www.autodesk.co.uk/products/powermill/features>

Autodesk PowerShape Premium 2022

<https://www.autodesk.co.uk/products/powershape/overview>

EZ EDM

A 2 through 5 axis wire EDM system, automatic machining strategies such as multi-pass contouring with stop, retract and cut-off options, and no-core-cut pocketing.

<https://ezcam.com/product-detail/ezedm/>

GearTrax - gear, spline, sprocket and pulley modelling mathematical software

<https://www.solidworks.com/partner-product/geartrax>

Rhino 6

3D CAD modelling software package to accurately model designs ready for rendering, animation, drafting, engineering, analysis, and manufacturing. It translates curves, surfaces, and solids, point clouds, and polygon meshes.

<https://www.rhino3d.com/>

Solidworks Premium with Finite Element Analysis

<https://www.solidworks.com/product/solidworks-simulation>

VISI PEPS-Wire 2022.0

VISI PEPS-Wire software maximises the features of our range of Sodick wire erosion machines. VISI PEPS-Wire includes specially developed feature recognition functionality:

- Hole features
- Constant and variable taper features
- Tapered with constant or variable land heights
- Manual, predefined or automatic calculation of start hole locations
- Automatic cutting and threading of the wire
- Comprehensive lead-in and lead-out strategies
- Multi-tagging
- Automatic slug retention strategies
- Multiple cutting
- Reverse cutting
- Pre-defined strategies enabling, for example, unattended, overnight cutting

Intuitive user interface

A choice of parameters such as machining direction, auto offsetting, lead on/off radius, tag distance, lead off distance, lead on/off technology. Each parameter is accompanied by an interactive bitmap giving the user additional information on how it will affect the resultant toolpath.

Easy feature editing

It is very simple to edit advanced features such as 4 axis or variable tapers. User 'constraints' or 'synchronisation lines' are easily added to 4 axis features and the results dynamically update; particularly useful when designing extrusion dies. Variable tapered features can be edited graphically by dragging the angle on individual faces of the feature; this is achieved using interactive graphical sliders.

Automatic cutting strategies pre-defined cutting strategies with sequences for roughing, finishing and separation cuts. These processing strategies can be used in both manned and unmanned production. Both punch and die strategies are available resulting in quick and easy programming of complex parts.

WIRE EDM simulation A solid based, kinematic simulation of the complete toolpath is available, with display of workpiece, target component, clamps and machine parts. During the simulation, collision checking is performed and, if a collision occurs, this is graphically displayed on the model and a warning issued. As slugs become detached, the simulation advises the operator and graphically removes the part, emulating the cutting process on the machine tool exactly. Toolpath verification also tests whether the completed part is removable from the component. It is also possible to perform a part comparison between the target model and cut part, highlighting any rest material or gouges.

https://bynder.hexagon.com/m/3be14c8e44985bca/original/Hexagon_MI_VISI_PEPS-WIRE_EDM_Brochure_A4_EN_web_2020.pdf

Additive Manufacturing / 3D Printing/ 3D Scanning

Form 2 SLA 3D Printer x 2 <https://formlabs.com/store/uk/form-2/>

Ultimaker 3 Professional 3D printer <https://ultimaker.com/3d-printers/ultimaker-3>

Mark Two Desktop 3D Printer carbon fibre

<https://markforged.com/mark-two/?mfa=sga-em-bof-branded&adg=101430127115&kw=mark%20two&device=c&gclid=Ci0KCQjwrIf3BRD1ARIsAMuu gNv zoFZ 2wk55tD7IDwgtZNXOxW UqcZyCp6Gliq4b00Ne2VRRUqClaAh7XEALw wcB>

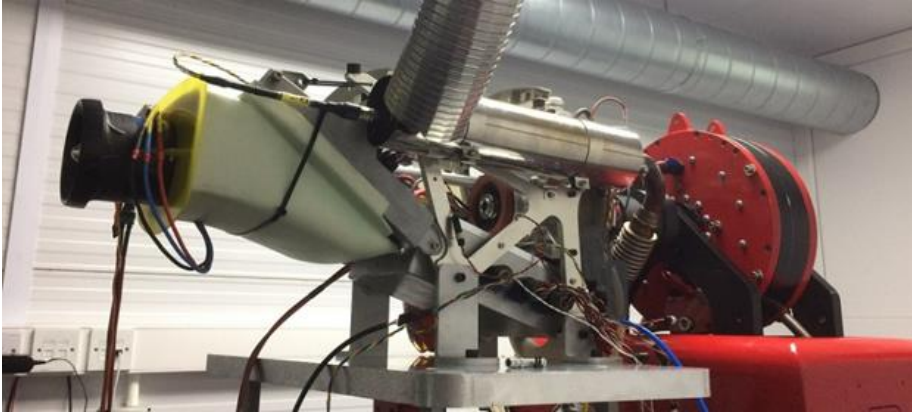
Portable 3D scanning

Creaform Handyscan 3D

Revopoint Trackit 3D scanner

Hexagon Absolute Arm

Engine testing dyno facility



We have invested in a bespoke engine testing unit with an Engine Dynamometer for testing and developing propulsion systems.

This facility has been used to develop our own products and can be hired by clients requiring engine testing support. Sound proofed, highly computerised and fully supported including operational and environmental quality system, safety systems, extraction and high security.

Dynamometer - Land and Sea DYNO-mite C 50hp, eddy-current brake

<https://www.dynomitedynamometer.com/eddy-current-liquid-dynamometer/liquid-cooled-eddy-current-dynamometer-specifications.htm>



+44 0121 558 8352

www.amedm.co.uk

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