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AMSMicroTM

Operating Manual

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1 SPECIFICATIONS OF USE



DISCLAIMER

THE INTENDED USE OF THIS AMSMicro device is expressly limited to that set out in the GENERAL TERMS AND CONDITIONS: SUPPLY OF DIAMOND VERIFICATION INSTRUMENTS AND THIS OPERATING MANUAL.

DEBEERS UK LIMITED, AND/ OR ANY MEMBER OF ITS GROUP, SHALL NOT ACCEPT ANY RESPONSIBILITY FOR DAMAGE TO THE AMSMicro OR STONES THAT RESULT FROM ANY NON-ADHERENCE TO THE GENERAL TERMS AND CONDITIONS: SUPPLY OF DIAMOND VERIFICATION INSTRUMENTS AND/OR THIS OPERATING MANUAL.

The AMSMicro:

- Is an automated screening device intended for use in all locations where polished stones are handled and which meet the Specifications outlined in section 11 of this Operating Manual.
- Is designed to automatically feed, measure and dispense small, round brilliant, polished stones to discriminate natural diamond from lab grown diamond and diamond simulants.
- Is intended only for use with colourless or near-colourless diamonds.
- Will have an extremely high referral rate for natural brown and natural fancy colour diamonds.
- Is designed to screen a maximum parcel size of 200ct¹.
- Is not intended for use in the classification of other precious gems or diamond simulants, nor to detect the treatment of natural diamonds e.g. fracture filling, irradiation, or heat-treatments.
- The user shall ensure that the AMSMicro is only used to test parcels of stones which are: Colourless or near colourless.
 - Cleaned (acid or otherwise) prior to screening to give efficient rates of processing and to prevent grease and electrostatic charge causing the stones to adhere to each other or to surfaces within the machine.
 - Stones adhering to each other or to surfaces within the machine will not be processed correctly.
 - Round brilliant cut only.
 - Have a girdle diameter between 0.60mm (approx. 0.001ct) and 0.99mm (approx. 0.0033ct).
 - AMSMicro splits this overall size range into a number of narrower ranges including, but not limited to: 0.6mm to 0.69mm; 0.7mm to 0.79mm; 0.8mm to

¹ Smaller parcels may be more efficient in terms of working practice, however.

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0.85mm and 0.9mm to 0.99mm. Each parcel to be screened using AMSMicro shall fall within one of these size ranges².

- have a maximum diameter variation between stones of 0.05mm.

Stones outside this range or cut will not be correctly handled and may damage AMSMicro and/or the stones. Stones which fall outside the above stated size limits and cut may not be retrievable from the AMSMicro. It is also likely that stones below the stated minimum size may not be correctly contained within the AMSMicro.

- Sieved to ensure that they are within the Specifications of Use in this section and that no debris or other foreign material is present.

Prior to use:

- The AMSMicro must be correctly installed in accordance with the 3708-4960 Installation Manual such that it is located in a suitable site which allows:
 - All of the Specifications detailed in section 10 of this Operating Manual to be met (and as may be directed by De Beers Technical Support from time to time).
 - The machine must be levelled using the levelling feet and the user must ensure that this level is reliably maintained.
 - The castors must no longer be in contact with the ground.
- The castor brakes must be applied.
- The levelling feet must be deployed and bearing the full weight of the machine.

2 PATENTS

United States patent numbers: US 10,082,469 and US 10,345,245.

3 RELATED DOCUMENTATION

The following documentation is supplied with AMSMicro (see section 5.8). Additional copies are available on request (see section 14 for contact information).

Document Number	Title
3708-4960	AMSMicro Installation Manual
3708-4810	Certificate of Conformity
Humidifier Manual	Provided by the manufacturer of the humidifier
3708-4810	Packing List

4 SAFETY

This section describes the safety precautions required to safely operate AMSMicro.

² Sieving is an efficient way to ensure that the stones to be screened are accurately sized.

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4.1 SYMBOLS

The following symbols are used throughout this manual to highlight specific areas or operations of AMSMicro where potential safety issues to personnel may occur.



WARNING

CAUTION – USE OF CONTROLS OR ADJUSTMENTS OR PERFORMANCE OF PROCEDURES OTHER THAN THOSE SPECIFIED HEREIN MAY RESULT IN HAZARDOUS RADIATION EXPOSURE.



WARNING

MISUSE OF CONTROLS OR DEVIATION FROM THE PROCEDURES SPECIFIED IN THIS MANUAL MAY CAUSE SERIOUS INJURY OR DEATH.



CAUTION

MISUSE OF CONTROLS OR DEVIATION FROM THE PROCEDURES SPECIFIED IN THIS MANUAL MAY CAUSE INJURY.

4.2 GENERAL SAFETY



CAUTION

AMSMicro MUST ONLY BE USED IN ACCORDANCE WITH THE INSTRUCTIONS GIVEN IN THIS OPERATING MANUAL. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD IMPAIR THE SAFETY PROTECTION THAT IS PROVIDED.



CAUTION

CONSULT THE INSTALLATION MANUAL (SECTION 3) FOR DETAILS OF SITE REQUIREMENTS AND INSTALLATION PROCEDURES.



CAUTION

INSPECT AMSMicro BEFORE OPERATION. IF ANY DAMAGE IS NOTED, DO NOT OPERATE AMSMicro AND CONTACT DE BEERS TECHNICAL SUPPORT USING THE DETAILS IN SECTION 13.



WARNING

AMSMicro WEIGHS MORE THAN 250KG AND MUST ONLY BE MOVED BY TWO OR MORE PEOPLE.



WARNING

WHEN MOVING AMSMicro ENSURE THAT APPROPRIATE HANDLING PROCEDURES ARE FOLLOWED AT ALL TIMES AND THAT WHEN AMSMicro IS NOT BEING MOVED ALL CASTOR BRAKES ARE APPLIED.



WARNING

EARTHING OF AMSMicro IS ACHIEVED USING THE SUPPLIED MAINS LEAD. DO NOT USE AN ALTERNATIVE.



WARNING

AMSMicro MUST BE POSITIONED AS PER THE INSTALLATION MANUAL (SECTION 3) SUCH THAT IS NOT DIFFICULT TO OPERATE THE DISCONNECTING DEVICE.

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WARNING

AMSMicro CONTAINS A CLASS 4 LASER PRODUCT AND A GROUP 3 ULTRAVIOLET (UV) SOURCE. USER SAFETY IS PROVIDED WITH APPROPRIATE GUARDING MEASURES WHICH MUST NOT BE CIRCUMVENTED. IN PARTICULAR, THE FRONT DOOR INTERLOCK ARRANGEMENT MUST NOT BE OVERRIDDEN, NOR THE AMSMICRO OPERATED WITH ANY EXTERIOR PANELS REMOVED.

4.2.1 DOOR INTERLOCK

The front door of AMSMicro features an interlock which disables the internal laser, robot, and UV source.

When the AMSMicro program is running and the front door is open, an “Interlock Open” message *Figure 1 – 1* will be displayed:

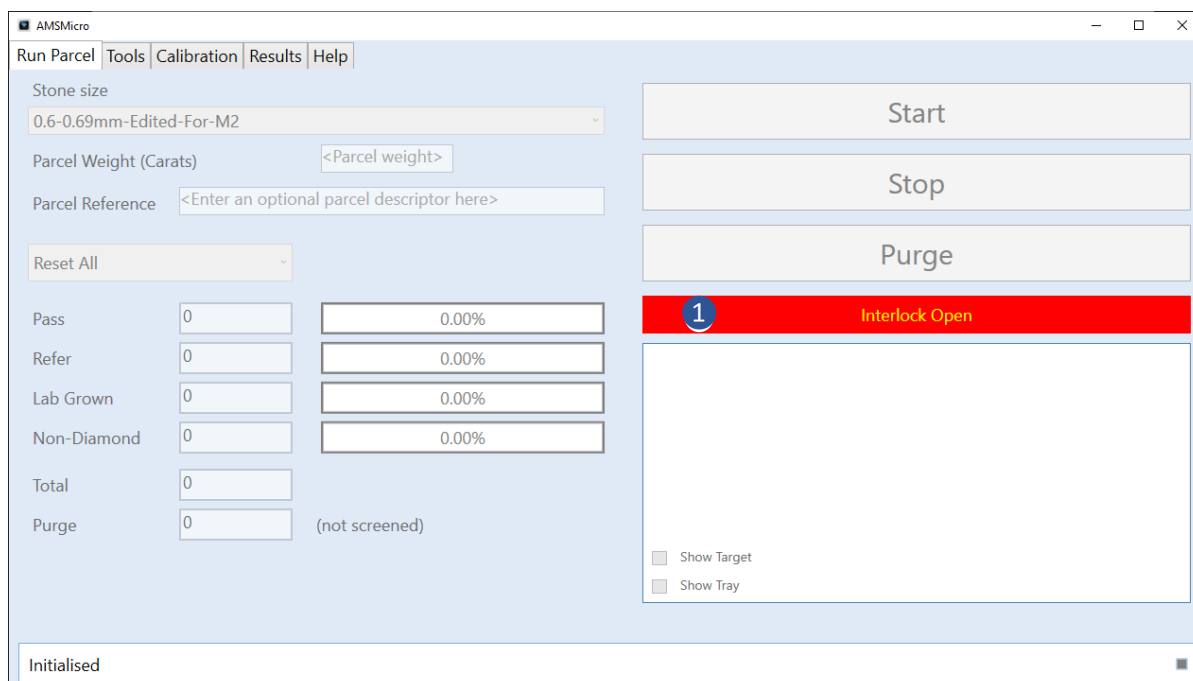


Figure 1 – Door Interlock Warning

4.2.2 CASTORS AND LEVELLING FEET



CAUTION

THE BRAKES ON THE CASTORS MUST ALWAYS BE APPLIED WHEN AMSMICRO IS NOT BEING MOVED.

REFERENCE SHOULD BE MADE TO THE INSTALLATION MANUAL (SECTION 3) BEFORE ATTEMPTING TO MOVE AMSMICRO.

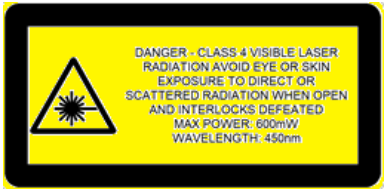
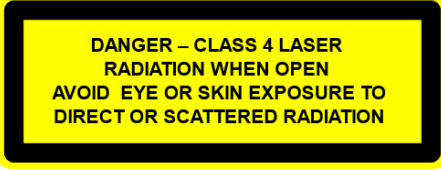
AMSMicro MUST NOT BE OPERATED WITHOUT THE LEVELLING FEET LOWERED AND BEARING THE FULL WEIGHT OF THE MACHINE.

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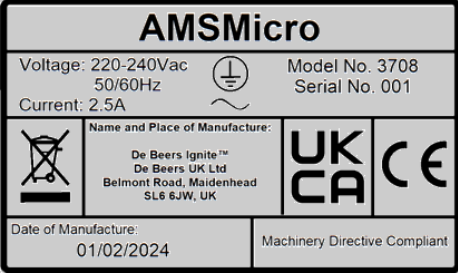
4.3 INSTRUMENT LABELLING

4.3.1 LABELS

Labels are placed at points inside and on the exterior of AMSMicro to indicate safety issues and other information.

LABEL	DESCRIPTION
	AMSMicro contains a Class 4 laser. A safety interlock is fitted to the front door making AMSMicro a Class 1 laser product.
	All Class 4 lasers must bear both the Laser starburst and an explanatory label which must bear the wording: LASER RADIATION AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION CLASS 4 LASER PRODUCT All Class 4 lasers must also have an aperture warning label indicating the location of the laser aperture.
	An aperture warning label is used to give an indication of where the laser beam exits a chamber or device, so that persons can ensure that they do not put themselves at risk by exposing themselves to the beam.
	Denotes an aperture emitting laser radiation under operation. AMSMicro contains a Class 4 laser. A safety interlock is fitted to the front door making AMSMicro a Class 1 laser product.
	Denotes an aperture emitting ultraviolet (UV) radiation under operation
	Indicates the class of ultraviolet (UV) source and provides a warning of the risk to the user when in operation with the safety interlocks defeated.
	Affixed to panels requiring tools to open. Only suitably trained servicing personnel should remove these panels.

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LABEL	DESCRIPTION
 AMSMicro Voltage: 220-240Vac 50/60Hz Current: 2.5A Model No. 3708 Serial No. 001 Name and Place of Manufacture: De Beers Ignite™ De Beers UK Ltd Belmont Road, Maidenhead SL6 6JW, UK Date of Manufacture: 01/02/2024 Machinery Directive Compliant	Rating Label – This label provides information about AMSMicro including mains voltage requirements, model and serial numbers and regulatory information.
	Indicates the connection to an external interlock system.
	Indicates the quantity and rating of mains fuses for AMSMicro.
	EUROPEAN UNION ONLY This equipment is marked in compliance with EU directives 2012/19/EU and EN50419. It is marked with the recycling symbol as shown. It means that at the end of the life of the equipment it must not be placed in the normal domestic unsorted waste stream. Please return it to the manufacturer at the address below for appropriate recycling and disposal: De Beers Ignite™ De Beers UK Ltd Belmont Road Maidenhead, Berkshire SL6 6JW United Kingdom

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4.3.2 LABEL LOCATIONS

The following illustrations show the locations of all the safety labels fitted to the AMSMicro instrument.

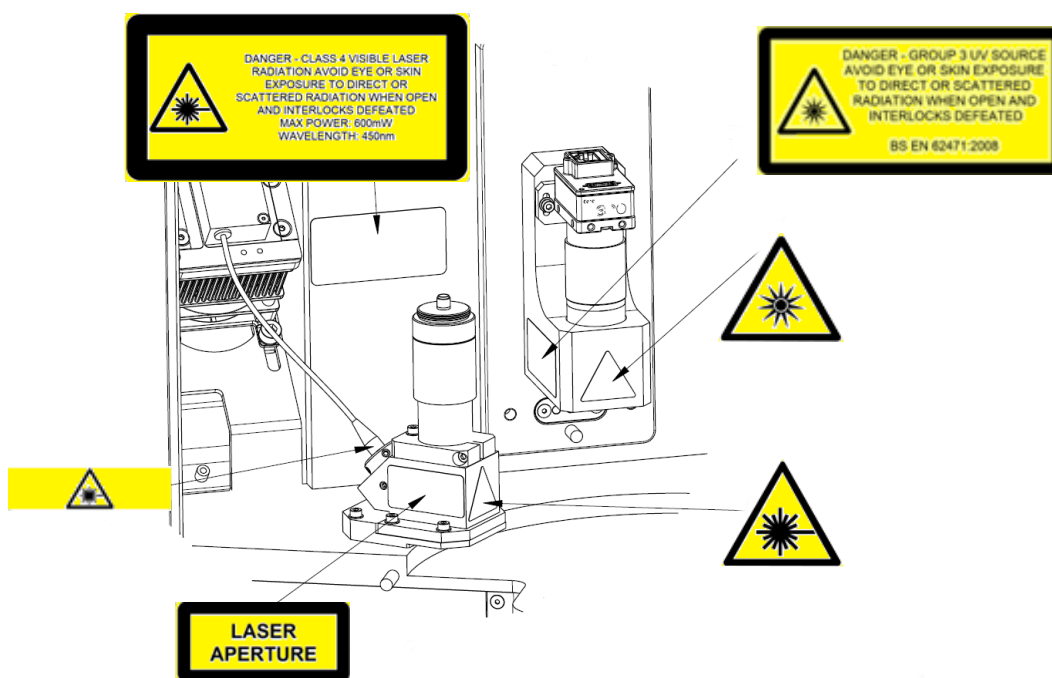


Figure 2 – Measurement Modules (Internal Covers Removed for Clarity)

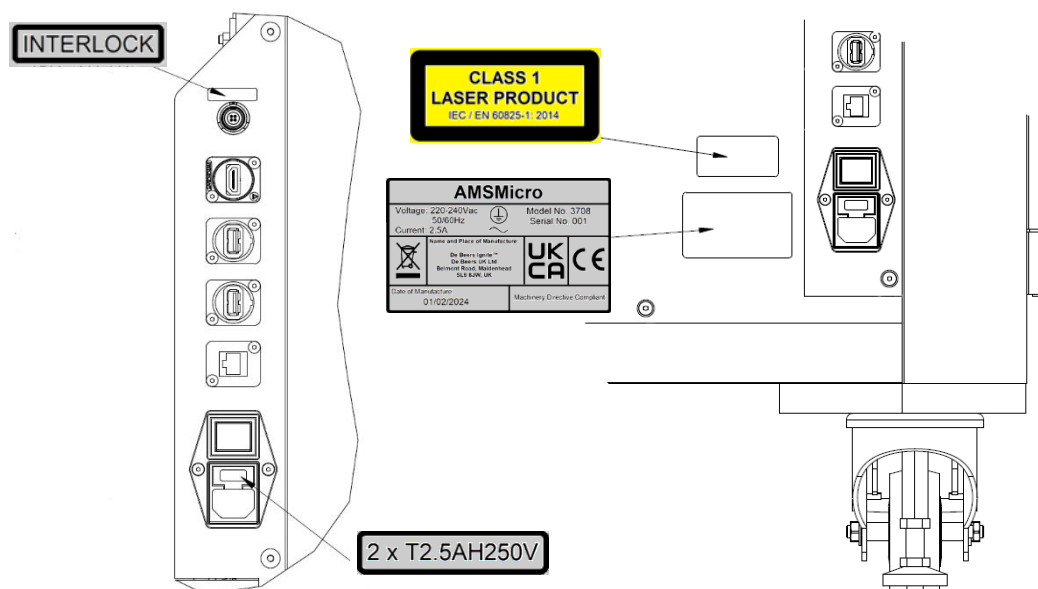


Figure 3 – Rear Connections

Figure 4 – Rear Panel

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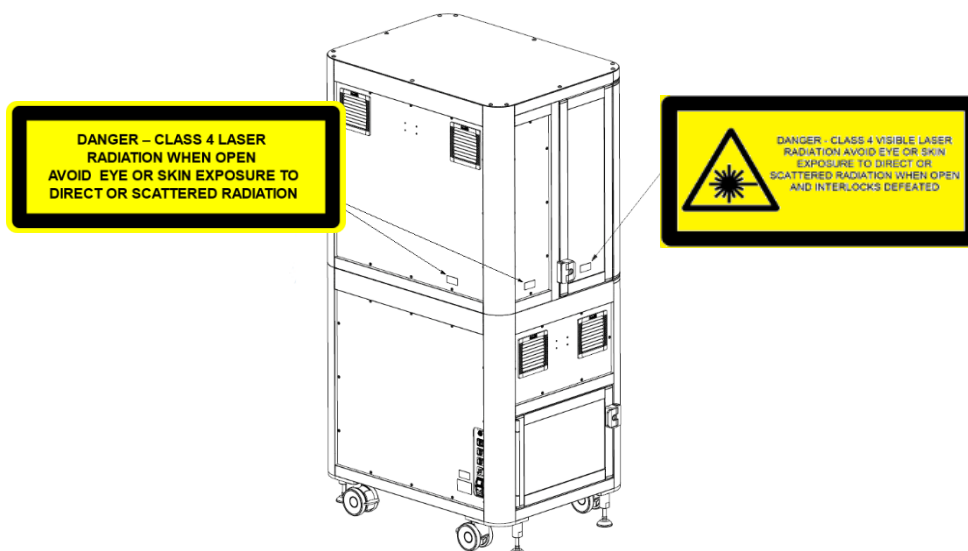


Figure 5 – Rear LH Corner

5 INTRODUCTION

AMSMicro is designed to automatically feed, measure, and dispense small, polished diamonds to discriminate natural diamond from synthetic or laboratory-grown diamond, and diamond simulants.

AMSMicro is designed to screen diamonds conforming to the requirements of the Specifications of Use in section 1 of this Operating Manual.

5.1 TYPICAL PERFORMANCE

With a typical parcel of at least 1000 round, natural diamonds conforming to the Specifications of Use in section 1 and a correctly installed, maintained and cleaned AMSMicro, a referral rate³ of less than 2%⁴ may be expected with a median dispense rate⁵ of more than 35 stones per minute (2100 stones per hour).

5.2 AMSMICRO IDENTIFICATION

The AMSMicro identification label is located at the bottom of the lower rear panel to the left of the external connections (see Figure 4). The model and serial numbers must be quoted in all correspondence relating to servicing and support.

³ The number of stones which are dispensed to the refer bin expressed as a percentage of the total number of stones in the parcel.

⁴ This referral rate figure assumes a single re-run of the refer, non-diamond and purge bins as well as any dropped stones.

⁵ See section 8.2.5

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5.3 EXTERNAL FRONT VIEW



Figure 6 –External Front View



Figure 7 –Control Panel

Figure 6 + Figure 7 No.	Title	Description
1	Front Door	The front door of AMSMicro allows access to the dispense bins, hopper, measurement modules and stone path. The door wraps around the left-hand side of the machine with a latch and lock on the left-hand side of the instrument. The door is part of a safety system which prevents user exposure to ultraviolet (UV) and/or laser radiation; it also prevents user interaction with the robot whilst the robot is moving. The door is safety interlocked; opening the door prevents the robot, laser, and UV strobe from operating.
2	Control Panel	Used to control and monitor the operation of AMSMicro.
3	Emergency Stop Button	When this is activated, the robot, laser, UV light source and disc operation all stop immediately. Once activated, the button will lock in position. It must be manually released to allow normal operation to resume.
4	Power On/Off Button	Press and release to turn AMSMicro on and off. When AMSMicro is turned on the periphery of this button will be illuminated red. When turning AMSMicro off ensure that the Computer Power On indicator (see below and section 7.3.3) is no longer illuminated.

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Figure 6 + Figure 7 No.	Title	Description
5	Computer Power On Indicator	Illuminates once the internal AMSMicro computer has booted up. It remains illuminated whilst the computer is active. Ensure this indicator is extinguished before removing power to the machine. Failure to do this can cause the hard disc of the computer to become corrupted. See also section 7.3.3.

5.4 EXTERNAL REAR VIEW AND EXTERNAL CONNECTIONS



Figure 8 –External Rear View

Figure 8 No.	Title	Description
1	Power Connector	AMSMicro is powered from a mains supply. An IEC mains lead is supplied and plugs into this socket. This socket incorporates two 2.5A fuses and an on/off switch.
2	Ethernet Port	This allows AMSMicro to be connected to a computer network with an internet connection. This allows software upgrades to be downloaded and remote support to be provided when required.
3	USB Ports	These two USB ports on the rear of the instrument allow additional user-supplied peripheral devices such as a mouse, keyboard, or printer to be connected to AMSMicro.
4	HDMI	This port may be used to connect a user-supplied HDMI monitor.
5	Interlock	Connection for an external safety interlock. This allows AMSMicro to be connected to an external interlock system. If this is not

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Figure 8 No.	Title	Description
		required an interlock dongle (supplied, see <i>Figure 12</i>) must be inserted into this socket.



WARNING

EARTHING OF AMSMicro IS ACHIEVED USING THE SUPPLIED MAINS LEAD. DO NOT USE AN ALTERNATIVE.



AMSMicro SHOULD BE DISCONNECTED FROM THE MAINS SUPPLY WHEN NOT IN USE.

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5.5 EXTERNAL LEFT HAND SIDE VIEW

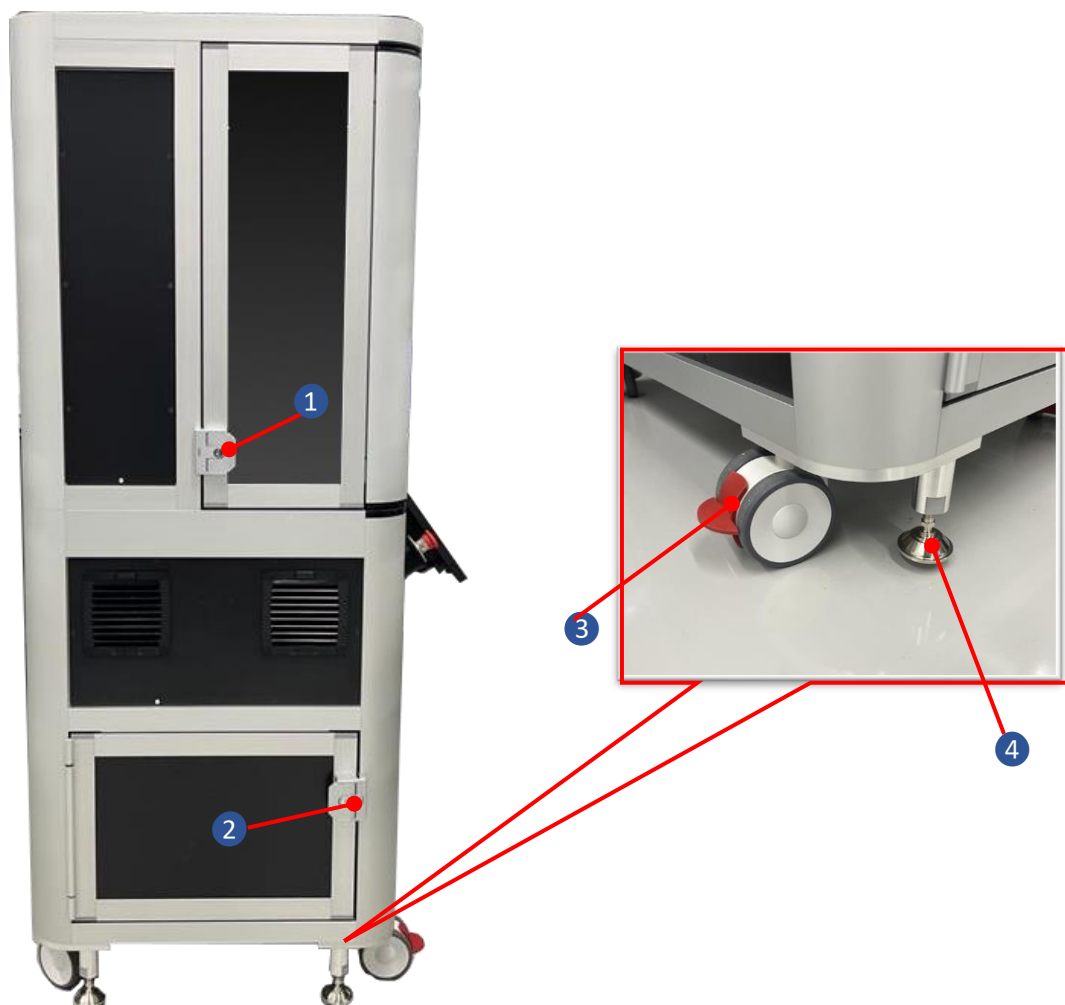


Figure 9 –Left Side View

Figure 9 No.	Title	Description
1	Front Door Latch and Lock	Secures the wrap-around door that gives access to the stone screening area in the front of the unit.
2	Service Access Door Latch and Lock	Secures the door that allows access to the services area of the unit.
3	Castor	Used to move the unit. Located on all four corners. Once the unit is in the desired position, push down the latch 3 on each castor with a foot to engage the brake.
4	Levelling Feet	These feet must be lowered prior to operation and are used to stabilise and level the machine. They are adjusted manually.

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5.6 INTERNAL VIEW



Figure 10 - Internal View

Figure 10 No.	Title	Description
1	Hopper	Stones are placed here for screening.
2	Feeder Tray	Agitates stones and, following imaging, guides the robot to pick up those which are table down.
3	Feeder Tray Retainer Cover	Prevents stones being lost in the tray retaining mechanism. It is attached to the feeder tray with small built-in magnets.
4	Vibrator Cover	Prevents stones being lost in gaps around the feeder subsystem.
5	Dispenser Assembly	Dispenses stones into the bins.
6	Dispenser Bins	Contain the stones which have passed through the machine
7	Spectroscopic Measurement System Cover	Protects the laser, cables and optical components from damage. It also provides secondary laser protection to the user.
8	Disc	Stones are placed onto this by the robot. The disc indexes, allowing each stone to be measured and then dispensed.
9	Disc Clamp	Locates and secures the disc.

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Figure 10 No.	Title	Description
10	Humidifier	Directs moist air into the machine to reduce electrostatic charge on the stones.
11	Robot	Picks stones from the Feeder Tray places them on the Disc. It is fitted with a replaceable nozzle with us used to pick up the stones. It is not necessary to change the nozzle to suit a particular stone size.
12	Stone Reclaim Bin	Contains stones which have been manually brushed through the aperture above it during machine clean down.
13	Imaging Measurement System Cover	Protects the camera, UV and visible light sources, and electrical connections.
14	Illuminator Cover	Allows access to the area beneath the imaging system during machine clear down.
15	Accessories Drawer	Used to store machine accessories, spares and tools.

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5.7 DIAMOND LOADING AND FEEDING AREA DETAIL



Figure 11 – Diamond Loading and Feeding Area

Figure 11 No.	Title	Description
①	Hopper	Parcels of diamonds are manually loaded here. The hopper is vibrated to cause stones to slide down the chute and into the Feeder Tray ②. The hopper is removable.
②	Feeder Tray	Stones are deposited into this tray from the hopper.
③	Not used	
④	Diamond Area Aperture	Stones which have fallen onto the upper plate (the area surrounding this aperture) can be manually swept into this aperture and into the stone reclaim bin ⑤ beneath.
⑤	Stone Reclaim Bin	Used to hold stones that have been swept into the Diamond Area Aperture of the machine.
⑥	Accessories Drawer	Used to store small machine accessories, spares and tools.

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5.8 ACCESSORIES

AMSMicro is supplied with a number of accessories, as shown in *Figure 12*.

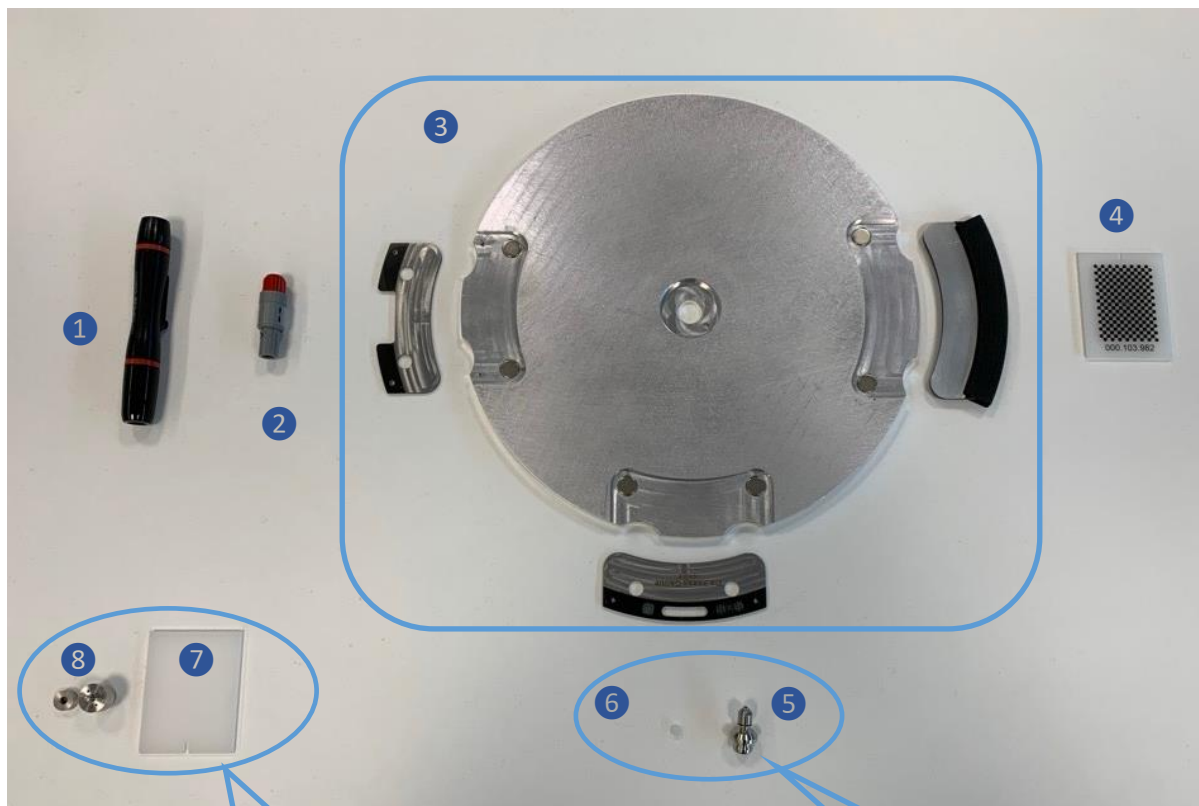


Figure 12 – Accessories

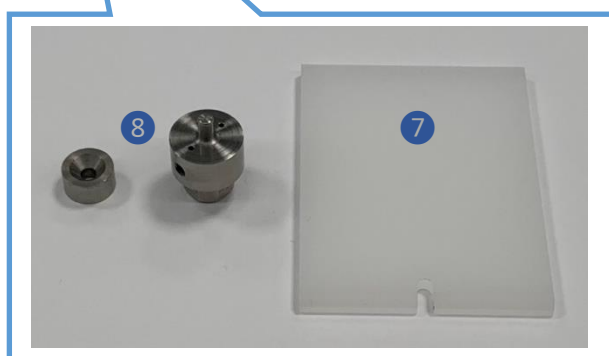


Figure 12 No.	Title	Quantity	Description	Part Number
1	Brush	1	Used to sweep stones from surfaces when machine is cleaned down.	LAB005604
2	Interlock Dongle	1	Must be inserted into socket on rear panel of the machine if an external safety connection is not used.	3708-7157
3	Colour Calibration and Verification Disc	1	This is used to both calibrate and verify that the calibration of the	3708-4002

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Figure 12 No.	Title	Quantity	Description	Part Number
	(including three inserts)		machine is satisfactory. The three magnetically attached inserts shown in <i>Figure 12-3</i> are used with this disc. See section 0.	
4	Chequer Plate	1	Used for alignment of the camera in the stone feeder system. See section 8.2.3.	ROB000103982
5	Nozzle	3	Fitted into the robot head to allow stones to be picked from the feeder tray and placed on the disc. One is normally supplied already fitted and a further two are provided as spares. (See also section 9.6). The supplied nozzles are suitable for all stone size ranges; it is not necessary to change nozzles to suit a particular stone size range.	3708-0361
6	Nozzle Filter	4	One of these white filters must always be fitted inside the nozzle when it is installed to prevent the ingress of dirt or debris into the vacuum system. One is normally supplied already fitted in the installed nozzle and a further three are provided as spares. See section 9.6.	PNEROBU15050
7	Hand-Eye Calibration Plate	1	Used for alignment of the vision system to the robot in the stone feeder system. See section 0.	3708-4006-0032
8	Hand-Eye Calibration Pin and Target	1	Used for alignment of the vision system to the robot in the stone feeder system. See section 0.	3708-4006-0031 (pin) 3708-4006-0030 (target)

Also supplied, but not shown in *Figure 12*, are the following:

Title	Quantity	Description	Part Number
Mains Lead	1	Suitable for the country for which AMSMicro was ordered.	Various
Operating Manual	1	This document	3708-4980
Installation Manual	1		3708-4960

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Title	Quantity	Description	Part Number
Certificate of Conformity	1		3708-4810
Packing List	1		3708-4961
5l Bottle Deionised water	1	Water, Analar Normapur	LABCH102923C
Humidifier Manual	1	Provided by the manufacturer of the humidifier	-

6 DESCRIPTION OF OPERATION

6.1 SUMMARY OF OPERATION

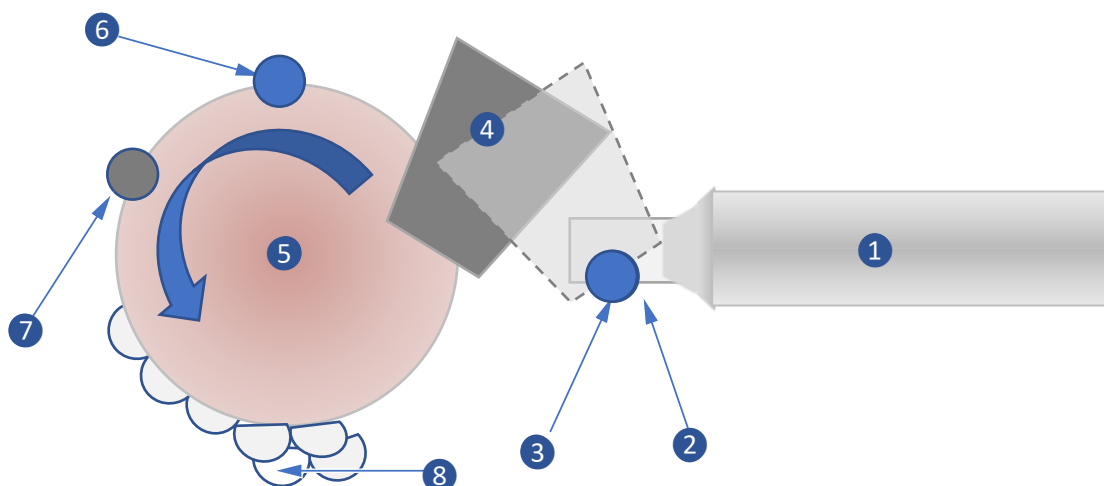


Figure 14 – Stone Path

Stones are manually loaded into the hopper ① which is mounted on a vibration device. When a screening run is started, the hopper is vibrated such that stones fall into the feeder tray ②. The stones in the feeder tray can be moved around by small actuators and a control system. This is used to optimise the number of stones that can be picked up. Once sufficient stones are detected in the tray by the camera ③ the hopper stops vibrating.

The camera ③ analyses the stones in the tray and identifies those which are orientated table down. The pick and place robot ④ then picks up in turn each table down stone and places it on the disc ⑤. There are 'positions' on the disc for 40 stones.

After each stone is placed, the disc rotates anti-clockwise by one step. Stones are presented first to an imaging measurement system ⑥ that analyses several optical properties of the stone. A spectroscopic measurement system ⑦ then analyses several different spectral properties of the stone.

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Based on the combined results of the two measurement systems, each stone is deposited in an appropriate dispense bin 8. See the section 6.2.7 for a description of the nature of the stones which are deposited to each bin.

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6.2 DETAILED DESCRIPTION OF OPERATION

AMSMicro is designed to automatically feed, handle, and dispense small, round brilliant, polished diamonds to discriminate natural diamonds from lab grown and diamond simulants.

6.2.1 STONE FEEDER

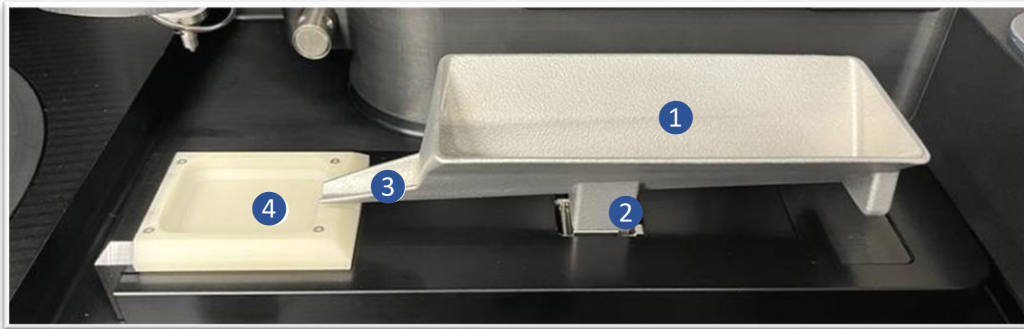


Figure 15 – Hopper

The AMSMicro Stone Feeder features a removable hopper (1) into which a parcel of stones for screening is manually loaded by the user. During a screening run, an intelligent vibrating mechanism beneath (2) agitates the hopper, causing stones to move down the chute (3) and fall into the feeder tray (4).

6.2.2 CAMERA

Once stones are present in the feeder tray (see Figure 15 – (4)), a camera mounted above it together with an image processing system identifies those which are table down. These stones (shown outlined in green in Figure 16) are suitable for the robot to pick up.

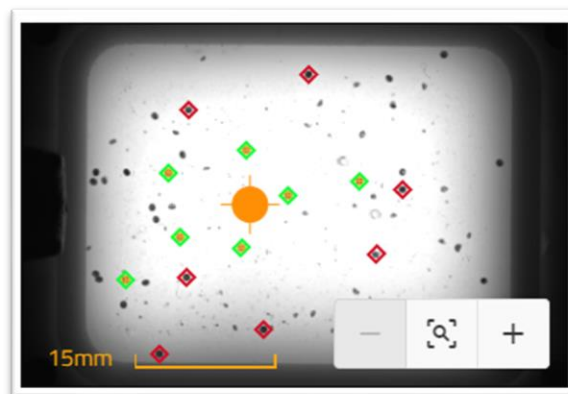


Figure 16 – Processed Image of Stones in Feeder Tray

6.2.3 Disc

Using vacuum, the robot picks up a stone with the nozzle (1) from the feeder tray (2) and places it on the disc (3). The disc then rotates by one increment and waits for the next stone to be picked up and placed on the disc. The disc is then stepped anticlockwise one position. Placement positions for 40 stones (4) are available on the disc.

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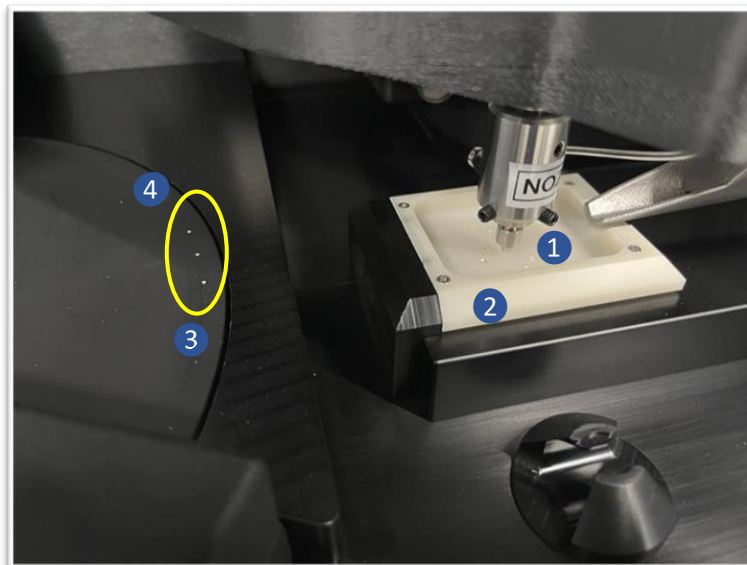


Figure 17 – Stone Transfer

6.2.4 MEASUREMENT SYSTEMS

During screening AMSMicro instrument uses the results of two different measurement techniques to determine into which dispense bin a particular stone should be deposited. These are techniques realised with two separate measurement systems: the imaging measurement system and the spectroscopic measurement system.

6.2.5 IMAGING MEASUREMENT SYSTEM

This measurement system uses a camera to take several images of the stone under different types of illumination with very precise timing.

6.2.6 SPECTROSCOPIC MEASUREMENT SYSTEM

This measurement system uses a laser to illuminate the stone and capture the spectral response of the stone with a spectrometer.

6.2.7 DISPENSE BINS

Analysis of the results from both the imaging and spectroscopic measurement systems allows the nature of the stone to be determined and for a decision to be made on which bin it should be dispensed to.

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Figure 18 – Stone Dispense Bins

AMSMicro dispenses stones into one of six bins located at the front of the instrument. These bins are labelled PASS, REFER, LAB GROWN, NON-DIAMOND, SPARE and PURGE. A diagonal line on the bins allows the user to check that the bins are correctly positioned. If a bin is missing an alert is displayed on the touchscreen when the AMSMicro program is running.

Figure 18 No.	Title	Description
1	PASS	Natural diamonds are deposited in this bin.
2	REFER	The occasional natural diamond will occasionally be dispensed into this bin. These are easily identified by standard gemmological tests that are typically carried out in grading laboratories. High purity CVD Lab Grown stones and some types of HPHT Lab Grown stones will be dispensed into this bin. Natural stones being dispensed into the Refer bin are generally caused by a marginal measurement result. Re-running these stones through the instrument may give a Pass result. See section 7.2.3.1.1 for the procedure to re-screen these stones.
3	LAB GROWN	HPHT Lab Grown stones and standard purity CVD Lab Grown stones will be dispensed into this bin. It is possible that natural diamond may also occasionally be dispensed into this bin. These natural diamonds can be identified using standard gemmological techniques.
4	NON-DIAMOND	Simulants or diamond imitations will be dispensed into this category.

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Figure 18 No.	Title	Description
		It is possible that natural diamond may occasionally be dispensed into this bin. Re-running these stones through the instrument may result in a pass or refer result. See section 7.2.3.1.2 for the procedure to re-screen these stones.
5	SPARE	Not Used.
6	PURGE	During a normal screening run, any stones which could not be measured are deposited in this bin. Re-running these stones through the instrument should result in a successful measurement. See section 7.2.3.1.3 for the procedure to re-screen these stones. <i>The Purge bin is also used to hold stones which have been dispensed using special mode called Purge. This mode, which is quite different from normal screening, is a method of quickly removing stones from the disc without measuring them. Such stones are deposited in this bin. See section 8.1.4 for details of this function.</i>

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6.2.8 HUMIDIFIER

The humidifier is used to create a stable internal humidity by generating a water mist in the stone handling area of AMSMicro. Increasing the humidity in this way reduces the potential of stones to adhere to each other or to the surfaces of the machine.

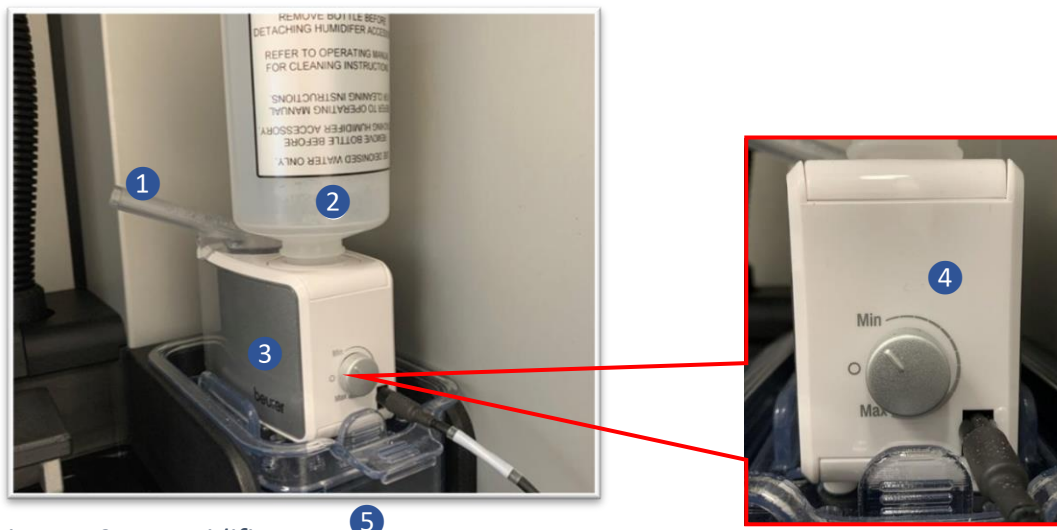


Figure 19 – Humidifier

Figure 19 No.	Title	Description
1	Water Mist Nozzle	Directs water mist to the stone handling area of AMSMicro. The amount of which depends on the setting of the Humidity Control as well as a sensor and control system 4.
2	Humidifier Bottle	Holds deionised water for the humidifier. The bottle can be removed for filling. It features a valve to prevent water leakage when it is removed and replaced.
3	Humidifier Module	Agitates the water to create a mist.
4	Humidity Control	Settings of O (Off), 'Min' (Minimum) to 'Max' (Maximum) control the humidity level. It should normally be set to 'Min' unless directed otherwise by De Beers technical support staff. Overall control of the humidity level is provided by a closed loop control system (not shown).
5	Power Connector	Powers the humidifier module.

Refer also to section 9.2 and the supplied instructions from the manufacturer of the humidifier.

7 USER OPERATION

The procedures outlined here should be closely followed to ensure efficient screening of stones.

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7.1 PREPARING FOR A SCREENING RUN

For optimal screening performance the following procedures should be followed prior to commencing a screening run.

7.1.1 CLEAN STONES

Verify that the stones to be screened have been acid cleaned prior to screening. This will promote efficient stone handling by removing grease or electrostatic charge which may cause the stones to stick to each other. Stones adhering to each other will not be processed correctly. Moreover, dirty stones will leave deposits on the internal surfaces of the machine which will give rise to handling difficulties with subsequent stone parcels.

7.1.2 SIEVE STONES

Verify that the stones to be screened with AMSMicro are of a consistent size which meets the requirements detailed in the Specifications of Use in section 1 and are appropriate to the available size ranges shown on the Run Parcel tab (section 8.1.1). This task is best achieved with a set of sieve plates.

7.1.3 WEIGH STONES

It is important to weigh the parcel of stones prior to loading it into AMSMicro. When these stones are later removed from AMSMicro, reweighing will allow any stone losses to be readily identified with little risk of mixing of stones with subsequent parcels.



IT IS IMPORTANT THAT THE BALANCE WHICH IS USED TO WEIGH THE PARCEL OF STONES HAS AN APPROPRIATE RESOLUTION AND ACCURACY TO ALLOW THE LOSS OF A SINGLE DIAMOND TO BE IDENTIFIED.

7.1.4 AMSMICRO PRE-SCREENING CHECKS

- 1) Open AMSMicro front door and verify that the humidifier water bottle is full. Fill if required. See section 9.2.1 for details of the filling procedure.
- 2) Verify that the Emergency Stop pushbutton (see *Figure 21* – ①) is pulled out.

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7.1.5 SWITCH AMSMICRO ON AND START THE AMSMICRO PROGRAM

- 1) Verify that AMSMicro is plugged into a mains wall outlet. If required, switch the wall outlet on.
- 2) Verify that the switch (see *Figure 20* – ②) next to the plug on the back panel of AMSMicro is turned on.



Figure 20 – IEC Mains Inlet and Switch

- 3) Press the on/off button *Figure 21* – ③ to turn on AMSMicro. The button surround will be illuminated red.
- 4) The internal AMSMicro computer will now boot. A green light *Figure 21* – ④ will illuminate once the computer is active.
- 5) The touchscreen *Figure 21* – ⑤ will display the DeBeers IGNITE wallpaper.
- 6) Ensure that the hopper, all dispense bins, and the stone reclaim bin are in position and empty.
- 7) Close the front door.
- 8) Double-click on the desktop AMSMicro icon to start the AMSMicro program. The Run Parcel tab (*Figure 18*) will appear by default.
- 9) The word “Initialising. Please wait...” (see *Figure 23* – ⑤) will appear in the the bottom left-hand corner of the Run Parcel tab. The initialising process may take up to 35 seconds, at which point, “Initialised” will appear and AMSMicro will be ready for use.

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Figure 21 – Control Panel

7.2 THE SCREENING RUN

7.2.1 STARTING THE SCREENING RUN

- 1) Open the front door.
- 2) Pour the diamonds gently into the centre of the hopper.
- 3) Gently tap the back of the hopper to disperse the stones more evenly. Stop tapping when the first stones are about to fall into the feeder tray.



IT IS ACCEPTABLE FOR A FEW STONES TO FALL INTO THE SCREENING TRAY.

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Figure 22 – Loading Stones into Hopper

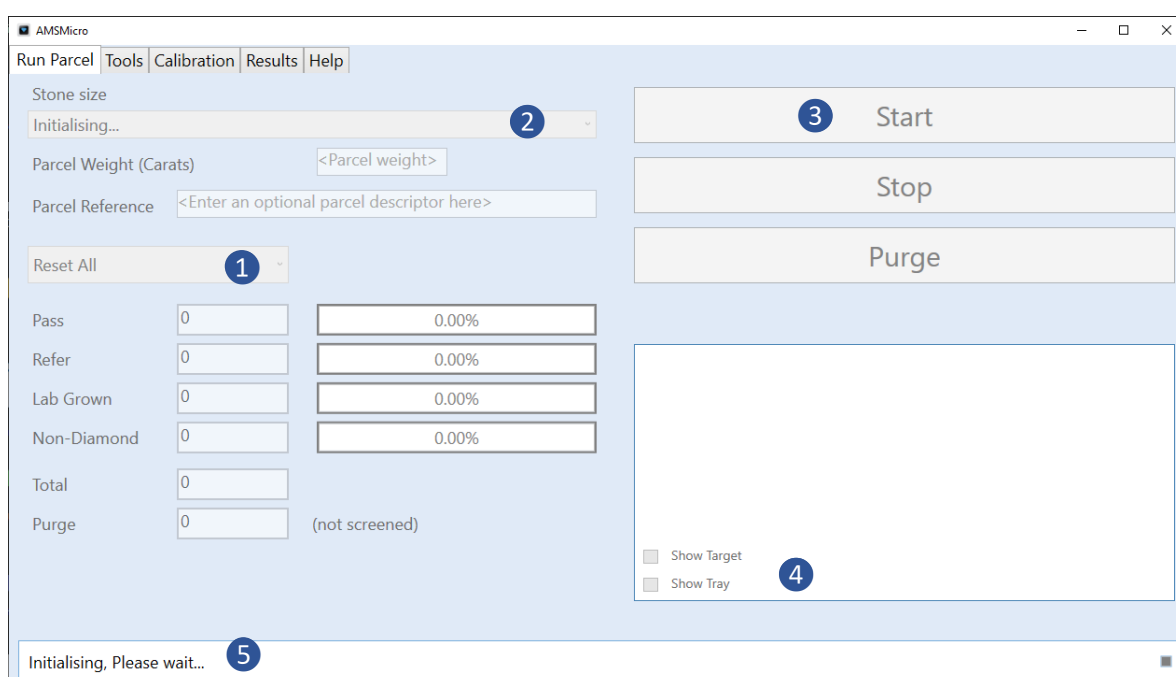


Figure 23 – Run Parcel Tab



IT IS ADVISABLE TO PLACE ONLY AS MANY STONES INTO THE HOPPER AS AMSMicro IS CAPABLE OF SCREENING UNDER LOCAL WORKING PRACTICES. FOR EXAMPLE, IF OVERNIGHT RUNNING WITH MELEE IS NOT PERMITTED BY LOCAL WORKING PRACTICES, LOAD ONLY THE NUMBER OF STONES WHICH CAN BE SCREENED IN THE TIME AVAILABLE. IT IS BETTER TO PUT FEWER STONES IN AND THEN ADD MORE EACH TIME THE MACHINE STOPS. IF AMSMicro STOPS IT MAY BE RESTARTED WITHOUT RESETTNG THE COUNTS. THIS IS PREFERABLE TO PUTTING MORE MELEE INTO AMSMicro AND THEN HAVING TO REMOVE THAT PORTION WHICH COULD NOT BE SCREENED AS EXCESSIVE HANDLING CAN GIVE RISE TO AN ELECTROSTATIC CHARGE ON THE STONES.

AS A ROUGH GUIDE, AMSMicro SHOULD MEASURE IN EXCESS OF 2100 STONES PER HOUR.

- 4) Reset the all the counts if required ①.
- 5) Select the stone size ②.
- 6) (Optionally) enter the weight of the parcel and a parcel reference. See section 8.1.2.

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- 7) Click the **Start** button **3**. AMSMicro will begin the screening process using optimal settings for the chosen stone size.



WHEN THE SCREENING OF THE PARCEL IS COMPLETE AMSMICRO WILL STOP AUTOMATICALLY. A RUN MAY ALSO BE STOPPED BY PRESSING THE 'STOP' BUTTON.

7.2.2 MONITORING A SCREENING RUN

Once a screening run is started, it is useful to occasionally monitor the run to ensure optimal performance.

It is strongly recommended that the first few stones of a run are observed to ensure correct operation. It is advisable to check that:

- Stones are being dispensed to the Pass bin.
- Stones are being fed sufficiently rapidly.
 - The feeder tray may be viewed by selecting on the Show Tray button (see *Figure 23 – 4* and section 8.1.5). This will allow the number of table down stones being identified (outlined in green) to be verified. It will also allow the user to check that the stones in the feeder tray are evenly spaced and that the feeder tray is not becoming flooded.



AMSMICRO IS DESIGNED TO OPERATE UNATTENDED. IT IS, HOWEVER, RECOMMENDED THAT THE USER CHECKS PERIODICALLY THAT A SCREENING RUN IS PROCEEDING CORRECTLY.

7.2.3 END OF SCREENING RUN

When the screening run is complete AMSMicro will stop automatically. A screening run may also be stopped by pressing the Stop button.

At the end of a run, some stones may remain unscreened. This may be for one of several reasons:

- Stones outside the capability of AMSMicro may have been fed into the instrument. Refer to the Specifications of Use in section 1.
 - Stones which are outside the selected size range should be re-run using the correct size range. If these are outside the size range or shape for which AMSMicro is designed alternative screening techniques will be required.
- A stone measurement failed to provide a definitive result.
- Stones may have been incorrectly placed on the disc or dropped during the placement process.

Any stones which could not be handled due to them being outside the selected size range will remain in the feeder tray.

Of those stones which were fed:

- If any remain unmeasured once on the disc, they will be dispensed to the purge bin.

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- Even when stones are measured successfully, a measured parameter may be marginal. As a result of this, such stones may be dispensed to the Refer or Non-Diamond bin. If a stone could not be measured for any reason it will be dispensed to the Purge bin.
- In many cases an improved pass rate will be achieved by retesting these stones.

The following sections describe the process of returning relevant stones to the hopper.

Once all relevant stones have been returned to the hopper and stone counts reset where appropriate, the screening run may be restarted.

7.2.3.1 Re-test Selected Dispensed Categories

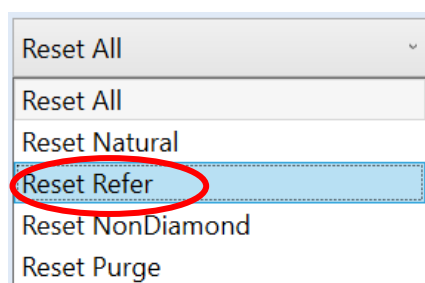


FOR CLARITY, THE FOLLOWING SECTIONS SHOW SEPARATELY HOW TO RESET AND RESCREEN EACH CATEGORY. IT IS, HOWEVER, QUITE REASONABLE TO RESET THE REFER, NON-DIAMOND AND PURGE COUNTS, RETURN THE CONTENTS OF THOSE BINS TO THE HOPPER AND RETEST ALL CATEGORIES AT THE SAME TIME.

7.2.3.1.1 Refer Retesting

The following procedure should be followed:

- 1) Remove the Refer bin and return the stones within it to the hopper.
- 2) Replace the Refer bin.
- 3) Close the front door.
- 4) Press the drop-down arrow to the right of the 'Reset All' button. Select 'Reset Refer' from the dropdown list which appears. This will reset the Refer count and percentage to zero.

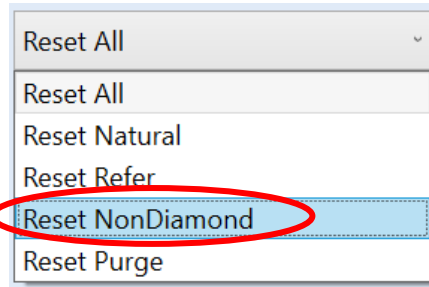


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7.2.3.1.2 'Non-Diamond' Retesting

The following procedure should be followed:

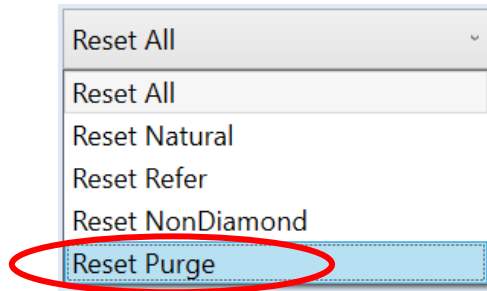
- 1) Remove the Non-Diamond bin and return the stones within it to the hopper.
- 2) Replace the Non-Diamond bin.
- 3) Close the front door.
- 4) Press the dropdown arrow to the right of the 'Reset All' button. Select 'Reset Non-Diamond' from the dropdown list which appears. This will reset the Non-Diamond count and percentage to zero.



7.2.3.1.3 'Purge' Retesting

The following procedure should be followed:

- 1) Remove the Purge bin and return the stones within it to the hopper.
- 2) Replace the Purge bin.
- 3) Close the front door.
- 4) Press the drop-down arrow to the right of the 'Reset All' button. Select 'Reset Purge' from the dropdown list which appears. This will reset the Purge count and percentage to zero.



7.2.3.2 Unfed Stones



THE FEEDER TRAY IS WHITE, SO IT MAY BE DIFFICULT TO SEE UNFED STONES. A TORCH IS HELPFUL FOR IDENTIFYING THESE STONES.

- 1) Remove any remaining stones from the feeder tray. These could not be fed. They may not have been fed due to:
 - Their size being smaller or larger than the selected stone size range. Refer to the Specifications of Use in section 1.

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- Sieving these stones may allow them to be retested with a more appropriate stone size selected. These should be put to one side whilst the remainder of the parcel is re-run.
- Their shape was not suitable for feeding. Refer to the Specifications of Use in section 1.
 - These should be tested using alternative screening techniques.

7.2.3.3 Dropped Stone Retesting

During the stone picking and placing process it is possible that some stones may be dropped. These stones will not have been measured and should therefore be re-run.

The process to recover stones is covered in detail in section 7.3.2, but briefly, look for stones:

- **On top of the feeder system baseplate.** If loose stones are found, they can be swept into the stone reclaim bin shown in *Figure 11* using the supplied brush. Take care not to flick the stones with the bristles of the brush.
- **On the disc.** Note that it is not possible to manually rotate the disc to ensure that it is clear.
- **Under the dispenser.** Remove the dispenser and check that no stones are on the lower deck of the machine.
- **Under the disc.** With the dispenser removed, the disc may be removed to allow any stones which fell into the gap between the disc and the top plate to be recovered.
- **In the dispenser.** Loose stones may be trapped in the foam wheels of the dispenser.

Stones recovered during this process should be returned to the hopper to be re-run.

7.3 AFTER SCREENING RUN

The following procedures should be carried out after a screening run to prepare AMSMicro for the next parcel.

7.3.1 WEIGHING THE STONES IN THE DISPENSE BINS

- 1) Weigh the contents of each dispense bin separately and add the values together.



THE SAME BALANCE WHICH WAS USED TO INITIALLY WEIGH THE PARCEL PRIOR TO THE SCREENING RUN SHOULD BE USED TO WEIGH IT AFTERWARDS.

- 2) Verify that each bin is empty.



KEEP THE CONTENTS OF EACH DISPENSE BIN SEPARATE.

- 3) The total weight of each bin should equal that of the initial parcel weight before screening.



IT IS POSSIBLE THAT SOME STONES MAY REMAIN WITHIN THE INSTRUMENT ONCE A SCREENING RUN HAS BEEN COMPLETED. IF ANY ARE FOUND, THE WEIGHT OF THESE SHOULD BE ADDED TO THE TOTAL.

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7.3.2 MACHINE CLEAN DOWN PROCEDURE

To be carried out after a run is complete and all stones have been sorted or purged from the disc.

For completeness, this section includes details of how to search for stones in all parts of the stone handling area of the machine. In practice stones will be seldom found in many of these areas (for example, under the imaging and spectroscopic measurement systems). With practice, users will rapidly learn which areas to check first.

A powerful torch (not supplied) is helpful for locating missing stones. For recovering lost stones, the following are recommended:

- A brush (supplied, see *Figure 12 – Accessories*)
- A powerful torch (not supplied)
- A pair of good quality tweezers (not supplied)
- A scoop (not supplied)



A POWERFUL TORCH IS A USEFUL AID TO LOCATING MISSING STONES. THE TORCHES IN MOBILE TELEPHONES ARE GENERALLY NOT SUFFICIENTLY POWERFUL FOR THIS TASK.

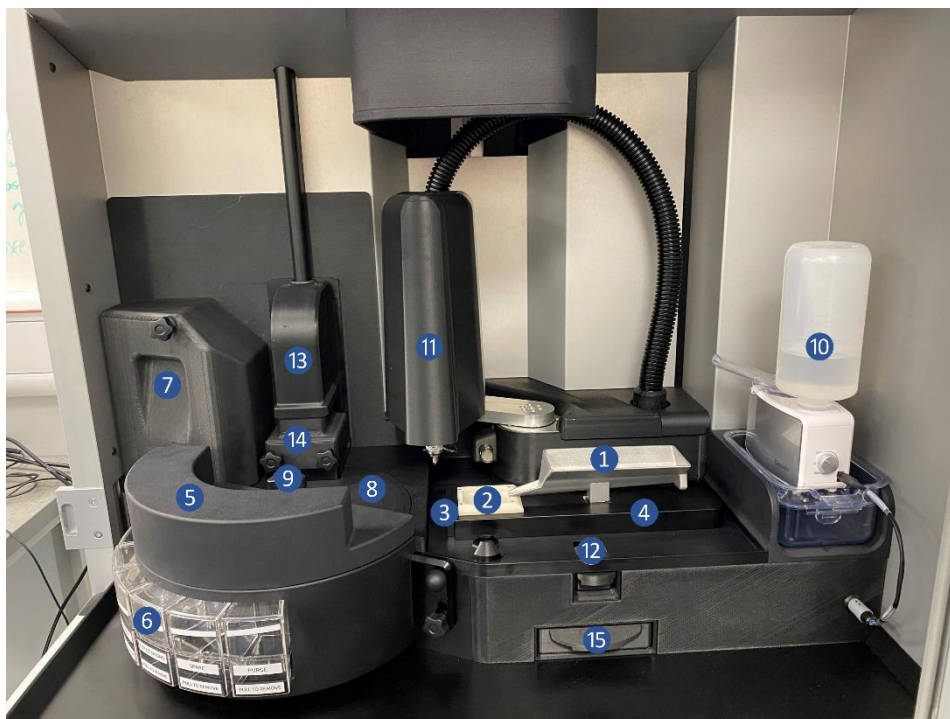


Figure 24 – Internal Components

Figure 24 No.	Title	Description
1	Hopper	Stones are placed here for screening.
2	Feeder Tray	Agitates stones and, following imaging, guides the robot to pick up those which are table down.

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3	Feeder Tray Retainer Cover	Prevents stones being lost in the tray retainer mechanism. It is attached to the feeder tray with small built-in magnets.
4	Vibrator Cover	Prevents stones being lost in gaps around the feeder subsystem.
5	Dispenser Assembly	Dispenses stones into the bins.
6	Dispenser Bins	Hold the stones which have passed through the machine.
7	Spectroscopic Measurement System Cover	Protects the laser, cables and optical components from damage. It also provides secondary laser protection to the user.
8	Disc	Stones are placed onto this by the robot. The disc indexes, allowing each stone to be measured and then dispensed.
9	Disc Clamp	Locates and secures the disc.
10	Humidifier	Directs moist air into the machine to reduce electrostatic charge on the stones.
11	Robot	Picks stones from the Feeder Tray places them on the Disc.
12	Stone Reclaim Bin	Contains stones which have been brushed through the aperture and into the reclaim bin during machine clean down.
13	Imaging Measurement System Cover	Protects the camera, UV and visible light optical sources and electrical connections.
14	Illuminator Assembly	Allows access to the area beneath the imaging system to allow machine clear down.
15	Accessories Drawer	Used to store machine accessories, spares, and tools.

NOTE: Throughout this process, refrain from touching stones, the inside of the hopper 1, the inside of the feeder tray 2, the robot nozzle and the top surface of the disc 8. Deposits of finger grease can cause stones to stick together and affect the performance of AMSMicro. If stone handling surfaces become contaminated, they may be cleaned as described in section 9.3.

- 1) Working from right to left, gently brush all stones down the chute of the hopper 1 into the feeder tray 2. Brush any dropped stones that might be between the feeder tray 2 and the disc 8 down into the stone reclaim bin 12. Any other loose stones around the machine or on the feeder cover 4, should also be brushed into the stone reclaim bin 12 or placed there using tweezers.
- 2) Remove hopper *Figure 25 – 3* from its mount by tilting the rear of the hopper downwards to cause the chute to raise as shown in *Figure 25 – 1*. It is advisable to use two hands to brace the hopper and prevent any remaining stones being thrown upwards.

	BE CAREFUL NOT TO TOUCH THE STONE HANDLING SURFACES. CONTAMINANTS MAY BE DEPOSITED, WHICH WILL GIVE RISE TO FEEDING DIFFICULTIES.
	A SLIDING COVER (SUPPLIED) MAY BE USED TO PREVENT ANY STONES REMAINING IN THE HOPPER FROM BEING THROWN OUT AS IT IS REMOVED.

- 3) Once the hopper can tilt no further, pull to the left to remove *Figure 25 – 2*.

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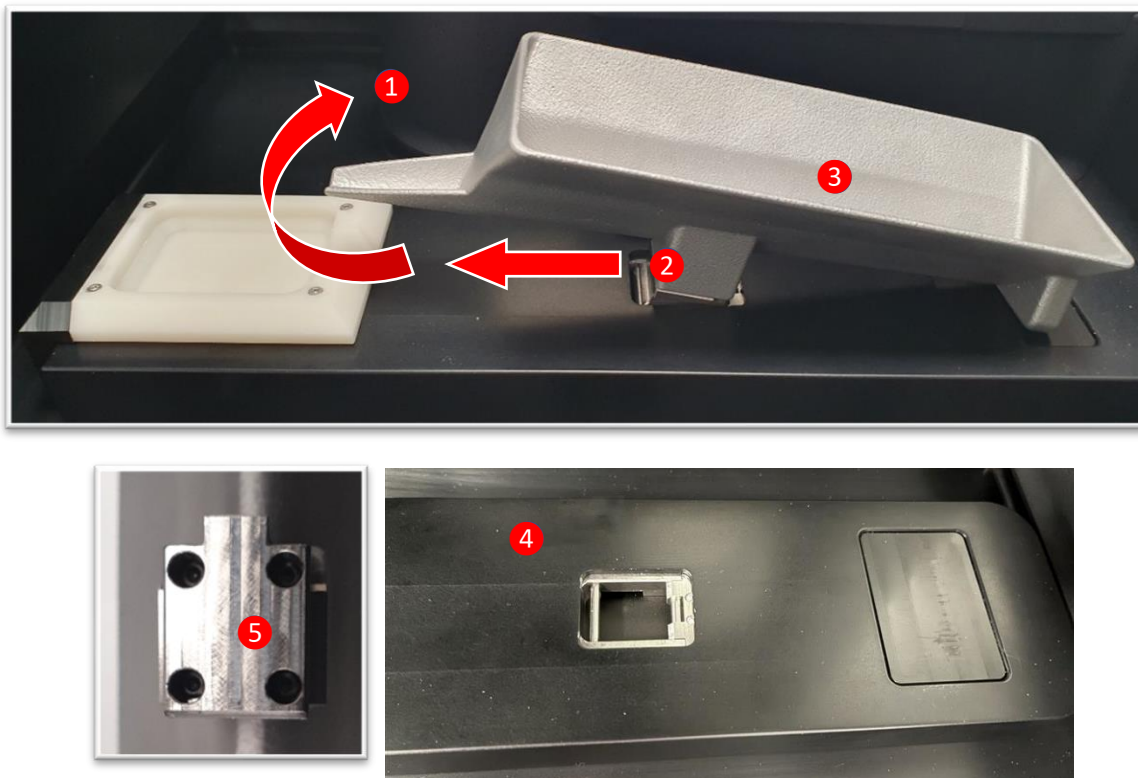
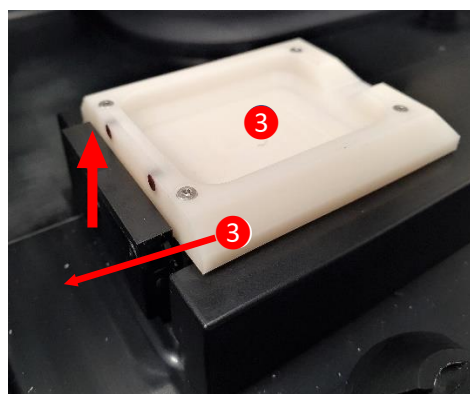
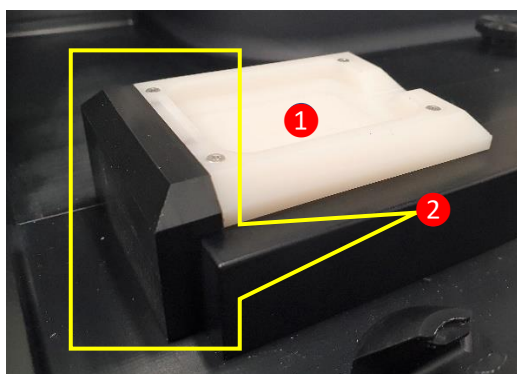


Figure 25 – Hopper Removal and Replacement

- 4) Remove the magnetic feeder tray retainer cover, see Figure 25 – ②, and then the feeder tray Figure 26 – ① by lifting the lever fully, Figure 26 – ③, and pushing it to the left. Whilst holding the lever with one hand remove the feeder tray with the other hand.
- 5) Brush any stones in the feeder tray into the stone reclaim bin Figure 24 – ⑫.



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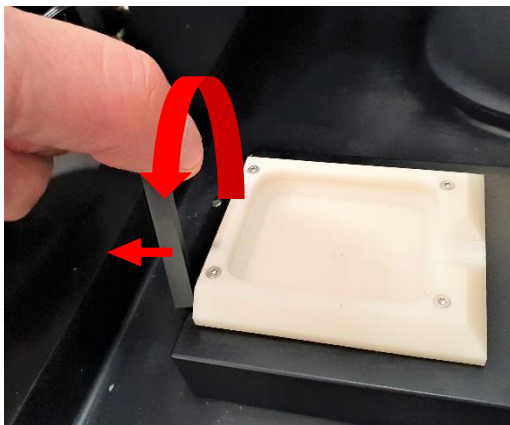
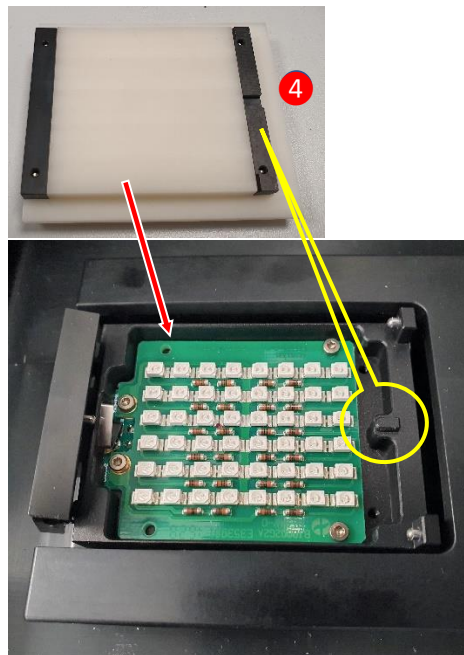


Figure 26 – Vibration Tray Removal and Replacement



- 6) Lift the vibrator cover at both ends *Figure 27* – ① to remove.

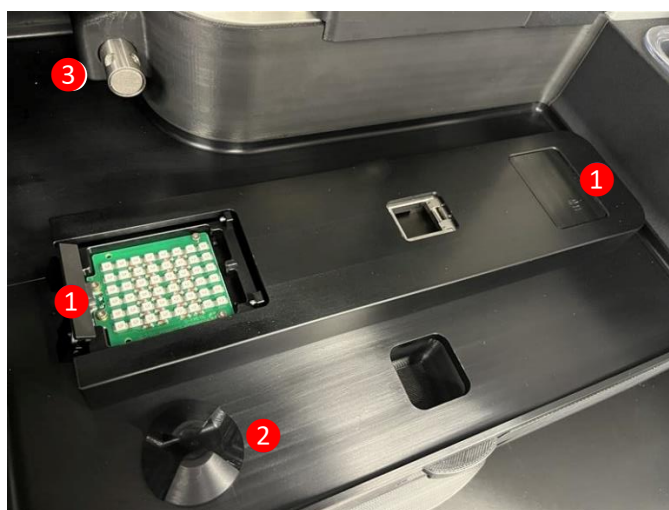


Figure 27 – Vibrator Cover Removal

- 7) Check around the right-hand side of the machine for any other loose stones, before replacing the removed components in reverse order and moving on to the left-hand side of the machine. Key places to check:
- the feeder tray *Figure 24* – ② in case any stones have stuck to the surface.
 - the top left corner of the vibration cover *Figure 24* – ④
 - the component (if fitted) in front of the feeder *Figure 27* – ②
 - the rear of the feeder system baseplate *Figure 27* – ②. A torch is particularly useful for this.

The vibrator cover slides back over the vibration mechanism as per *Figure 27*.

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Replace the feeder tray:

1. Pull the feeder locking lever, *Figure 26 – 3*, up and to the left. Whilst holding the lever with one hand, use other hand to replace the feeder tray, *Figure 26 – 1*, into the base noting orientation (slot *Figure 26 – 4* aligns with key on bottom of tray). Release lever to lock the feeder tray in position and then push the lever downwards. Replace the cover *Figure 26 – 2* on the left-hand side of the feeder tray. Grasp the feeder tray and confirm it is fully engaged in position:
 - It should move slightly against its springs in each direction with a slightly ‘rubbery’ feel.
 - It should not move very freely.
 - It should not rattle.
 - there should be a clear gap under the edge of the feeder tray, so it does not contact the vibrator cover.
2. Align the Hopper notch *Figure 26 – 5* (at an angle as shown) with the slot in the base location shoe *Figure 26 – 4* and then push backwards and down to lock it in position.



THERE IS A NOTCH (*Figure 26 – 5*) ON THE BOTTOM OF THE HOPPER *3* THAT SLIDES INTO A SLOT IN THE BASE LOCATION SHOE *4*.

- 8) Empty the dispenser bins *Figure 24 – 6*, as per section 7.3.1 ***Weighing the Stones in the Dispense Bins*** – ensuring they are replaced in the correct position such that the diagonal line is continuous, see *Figure 28*.



Figure 28 – Correct Dispenser Bin Locations

- 9) Undo the two thumb screws either side of the dispenser assembly (*Figure 29*) and remove it by pulling it squarely forwards (two dowel pins line this assembly up with the rest of the machine). Shake the assembly gently over the machine so that any loose stones fall into the machine.

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CAUTION

ENSURE SUITABLE PROTECTIVE FOOTWEAR IS WORN WHEN REMOVING THE DISPENSER ASSEMBLY.



Figure 29 – Dispenser Assembly Removal

- 10) Tilt the dispenser assembly to allow the inner area to be checked. Stones could fall from the disc and become caught in this groove:



Figure 30 – Inside View of Dispenser Assembly

- 11) Undo the thumb screw on the laser cover **7** and remove it by sliding it upwards and over the laser – two dowel pins locate it.
- 12) Unscrew the Disc Clamp **9** from the middle of the disc **8** without touching the surface of the disc – to prevent finger grease deposits only the underside of the disc should be

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touched (see *Figure 31*). Slide the disc **8** out from under the illuminator assembly **14** and check around the area beneath for stones.

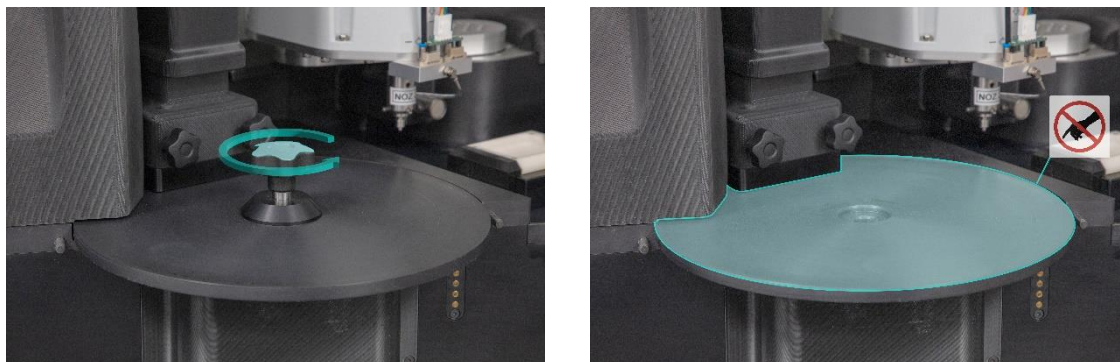


Figure 31 – Disc Removal

- 13) Remove both the camera cover **13** and illuminator assembly **14** by unscrewing the thumb screws. The camera cover may then be lifted off. The illuminator assembly may be removed by undoing the thumbscrews and sliding it towards the front of the machine once the Disc Clamp **9** has been removed.
- 14) Ensure that there are no loose stones around the left-hand side of the machine. Key places to check: the far corner under the robot **11**; the recess where the disc **8** sits; under the illuminator assembly **14**; under the laser cover **7** and under the dispenser assembly **5**.
- 15) Check also that all dispense bins are empty; single stones in particular may be difficult to see and are easily missed; use of a torch is advised.
- 16) Weigh the stones to check they are all accounted for using the same balance as was used prior to the run – see section 5.2.2.1.
- 17) Replace all machine components in the reverse order of their removal:
 - a. When the disc **8** is replaced, there is a small hole off-centre from the main thread; align the disc such that the two holes in the disc line up with the two holes in centre of the motor drive plate on which the disc sits. The pin and the thread of the Disc Clamp **9**, (see also *Figure 32*) can then be lined up with these two holes. Once lined up, push down on the shoulder of the Disc Clamp to engage the thread before tightening it gently.
 - b. When replacing the covers on the illuminator assembly **14**, laser cover **7** and dispenser assembly **5** ensure that they are lined up correctly with their associated dowel pins.



CAUTION

ENSURE SUITABLE PROTECTIVE FOOTWEAR IS WORN WHEN REPLACING THE DISPENSER ASSEMBLY.



CAUTION

THE ILLUMINATOR AND SPECTROSCOPIC MEASUREMENT SYSTEM COVERS MUST BE REFITTED.

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Figure 32 – Disc Clamp

18) AMSMicro is now ready for further use.

7.3.3 TURNING AMSMICRO OFF



CAUTION

AMSMicro MUST NOT BE SWITCHED OFF WITHOUT FOLLOWING THE PROCEDURE BELOW. FAILURE TO DO THIS IS LIKELY TO CORRUPT THE HARD DISC OF THE INTERNAL COMPUTER.

- 1) Check that AMSMicro is completely clear of stones and that all components such as the hopper, screening tray, disc, dispense bins, reclaim bin and internal covers are in place and correctly secured (where appropriate).
- 2) Check all doors are closed.
- 3) Select 'File->Close' or click the cross at the top right-hand side of the AMSMicro Program window.
- 4) Note that it may take several seconds for the AMSMicro Program to close the various subsystems inside AMSMicro.
- 5) Shut down the PC by selecting 'Start->Shutdown'.
- 6) Wait for the green power light **to the right of the ON/OFF button** on the front panel to be extinguished.
- 7) Once the green power light extinguishes, AMSMicro can be turned off using the ON/OFF button located on the front panel of the instrument.
- 8) Turn off the mains supply to AMSMicro using either the switch at the bottom of the rear panel or the switch at the wall socket.

8 THE AMSMICRO PROGRAM

Several different views (called 'Tabs') are available in the AMSMicro program. These allow screening run data entry and provide details of screening results and machine performance.

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WHEN A SCREENING RUN IS IN PROGRESS, ACCESS TO MANY TABS AND FUNCTIONS WILL BE LIMITED.

The AMSMicro program features five selectable tabs *Figure 33* – ① that allow control or monitoring of the machine. Status and error messages are displayed at position ②.

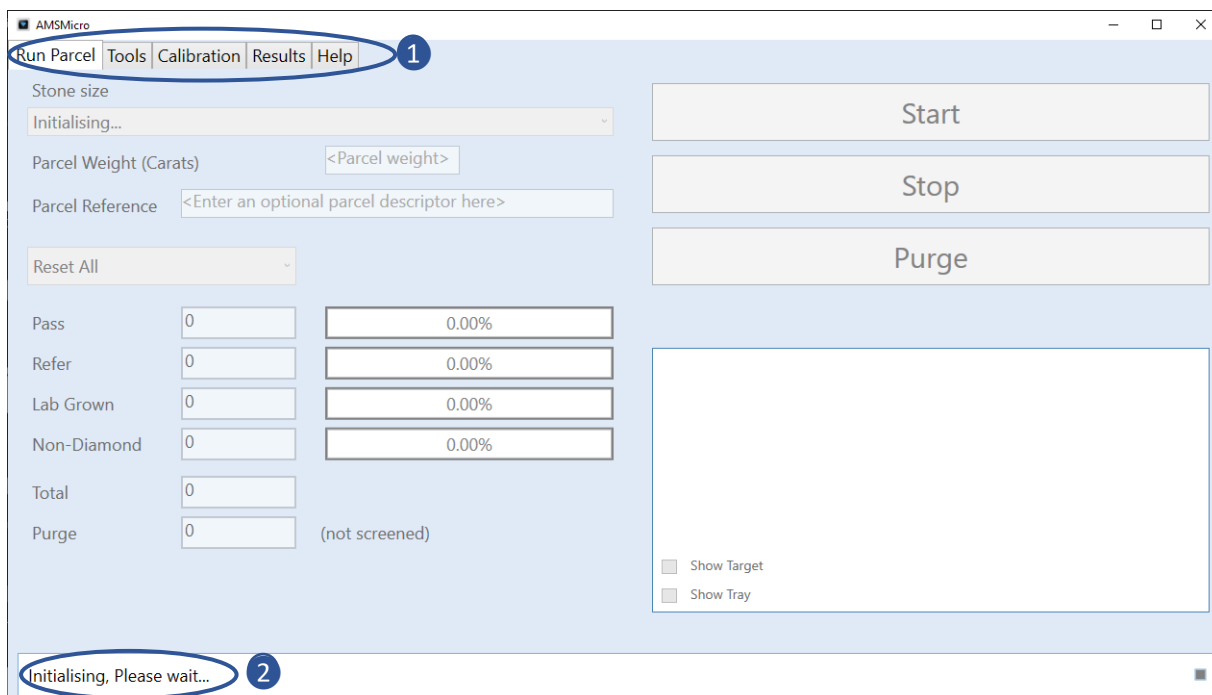


Figure 33 – Available Program Tabs with Run Parcel Tab Selected

8.1 RUN PARCEL TAB

This tab is shown in *Figure 33*. It is displayed on startup. For simple operation of AMSMicro this is the only tab the user requires.

8.1.1 STONE SIZE

It is essential that the correct stone size is entered to ensure optimal performance during the screening process.

The stone sizes are set in 0.1mm girdle diameter ranges. Click on the drop-down menu ① to select the range ② that best suits the parcel to be screened.

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Figure 34 – Select Stone Size-Run Parcel Screen

8.1.2 PARCEL WEIGHT (CARATS)/PARCEL REFERENCE

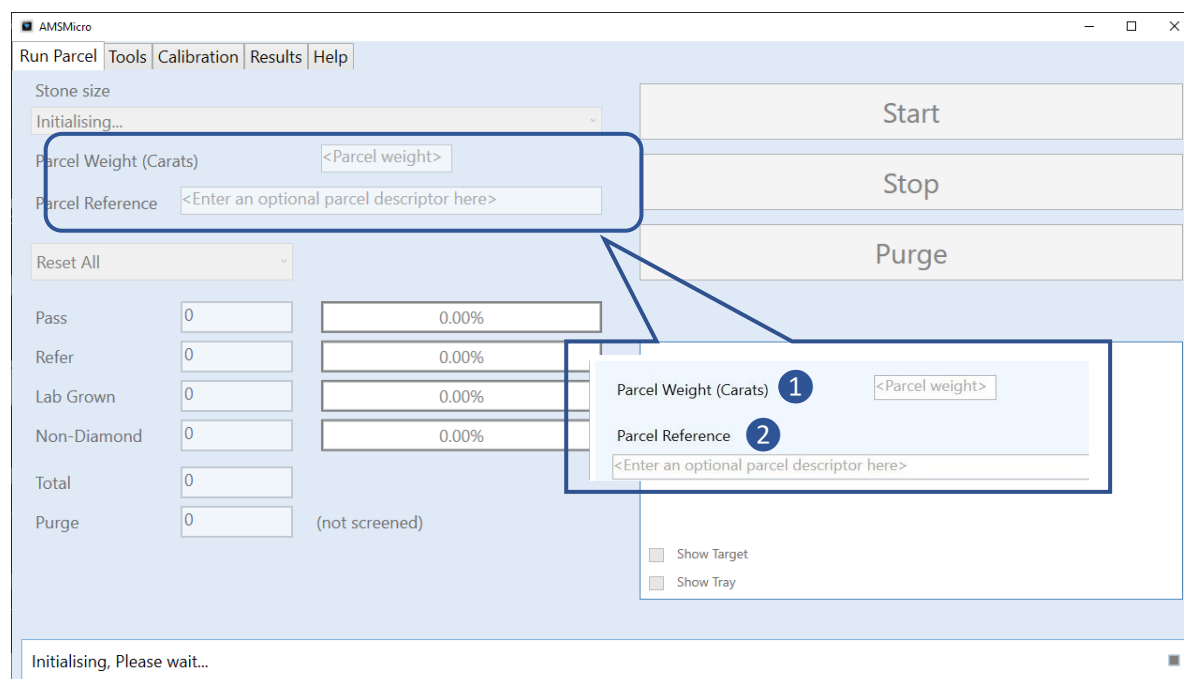


Figure 35 – Parcel Weight/ Reference

The optional Parcel Weight (Carats) ① allows the user to enter the total weight for the parcel to be screened. This weight is used for the estimated completion bar which appears during a screening run on the Run Parcel tab if a parcel weight has been entered. This offers a rough visual guide to how the screening run is progressing. The entered weight will also appear in any report on the screening results for that parcel.

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The optional Parcel Reference **2** allows the user to enter a description of the stone parcel being screened. This description will appear in any report on the screening results for that parcel.

8.1.3 BIN COUNTS AND PERCENTAGES

As stones are screened, they are deposited into the appropriate Dispense Bins and counted. Each bin total is displayed, as well as a total count beneath **1**. The count of each bin is expressed as a percentage of the total **2** which is also colour-coded (see also section 8.2.6 for details of setting the colour code thresholds).

Any stones which could not be measured⁶ are dispensed to the purge bin **3** see section 7.2.3.

AMSMicro

Run Parcel Tools Calibration Results Help

Stone size
Initialising...

Parcel Weight (Carats) <Parcel weight>

Parcel Reference <Enter an optional parcel descriptor here>

Reset All

Pass	0	0.00%
Refer	0	0.00%
Lab Grown	0	0.00%
Non-Diamond	0	0.00%
Total	0	
Purge	0	(not screened)

Start

Stop

Purge

Show Target

Show Tray

Initialising, Please wait...

Figure 36 – Screened Percentages

⁶ The purge bin may include multiply fed stones. Each multiple feed is counted as one stone.

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8.1.4 PURGE

AMSMicro features a special mode called **Purge** which is a method of rapidly removing stones that remain on the disc without measuring them.

The purge function is disabled whilst AMSMicro is screening stones.

Clicking the **Purge** button ① will purge only stones which remain on the disc. The purge action will either stop automatically once the disc has completed one rotation or may be manually stopped by clicking the **Stop** button ②.



IF THE STOP BUTTON IS PRESSED BEFORE THE END OF A COMPLETE PURGE CYCLE STONES MAY REMAIN ON THE DISC.

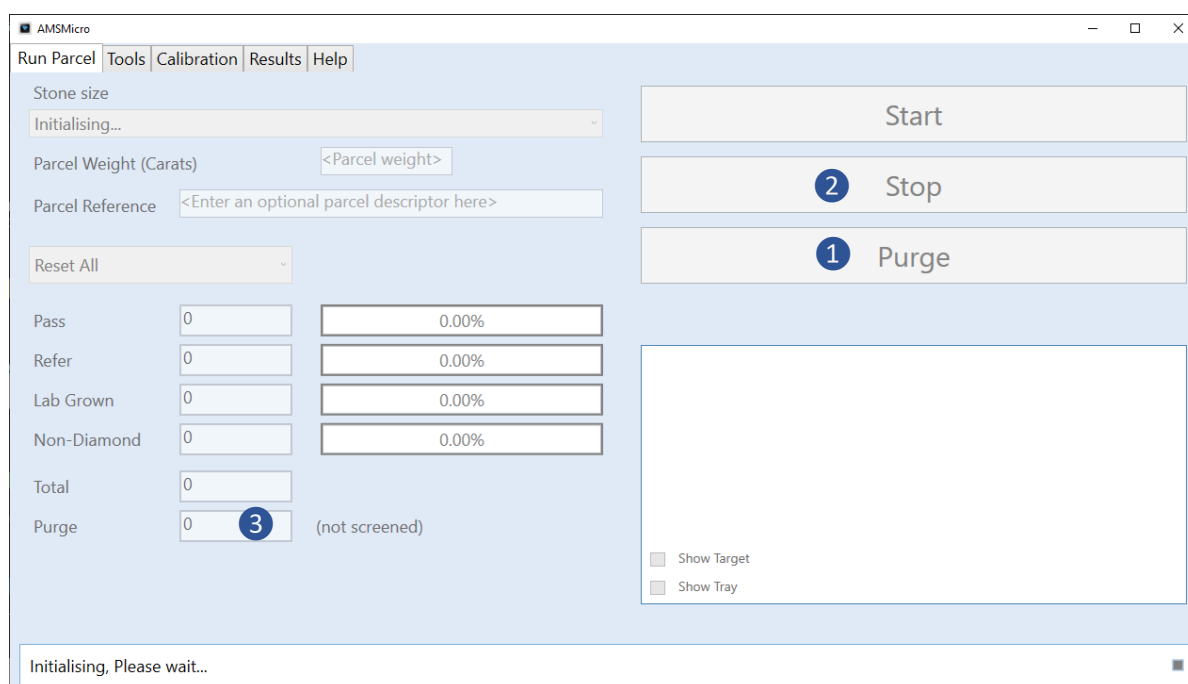


Figure 37 – Purge Function

8.1.5 FEEDER TRAY AND PLACEMENT DISPLAY

The display, Figure 38- ①, to the bottom right of the Run Parcel tab allows the contents of the feeder tray to be inspected. When a screening run is started this will be shown by default. See section 6.2.2.

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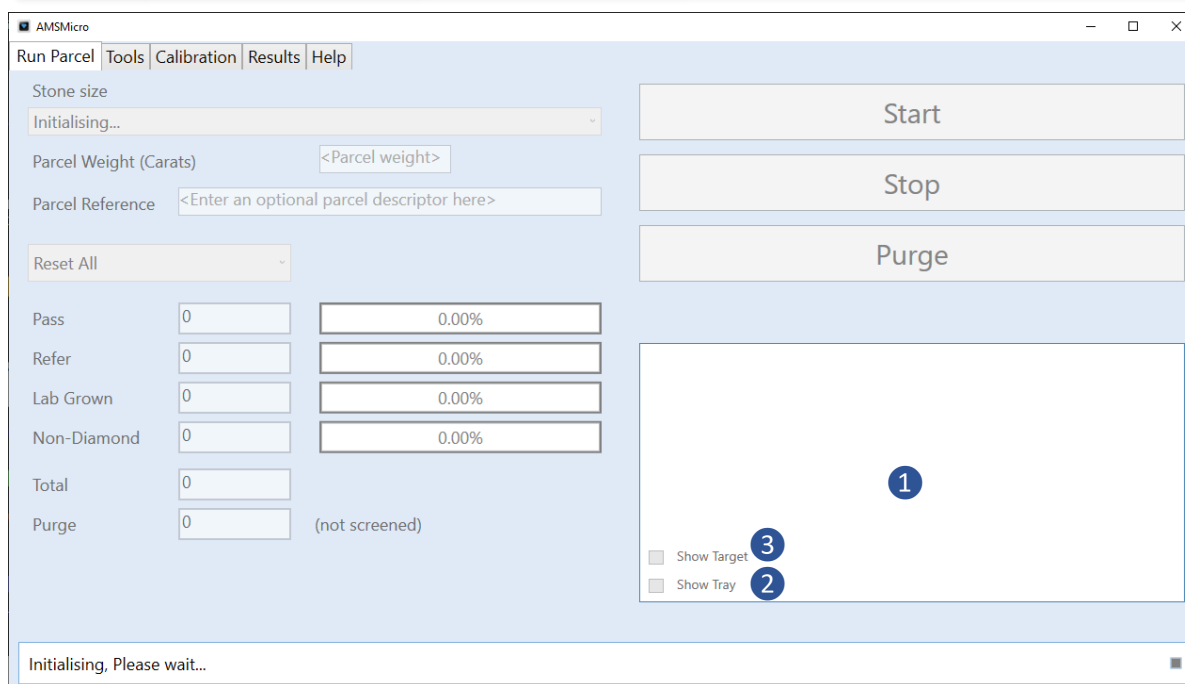


Figure 38 – Feeder Tray and Placement Display

Unchecking the 'Show Tray' option, Figure 38 - ②, will allow the stone placement and table down performance to be assessed⁷. Optionally, a placement target may be displayed by checking the 'Show Target' checkbox Figure 38 - ③. This circular target indicates the target area for stone placement; stones being placed outside this area are unlikely to be measured correctly and may be dispensed to the purge bin.

8.2 TOOLS TAB

The Tools tab allows access to control, support, performance, and maintenance functions. Within this tab a number of different views may be selected depending on the desired task. These views are shown as ① to ⑦ in Figure 39.

⁷ This will have no effect until the first stone to be placed reaches the imaging measurement system.

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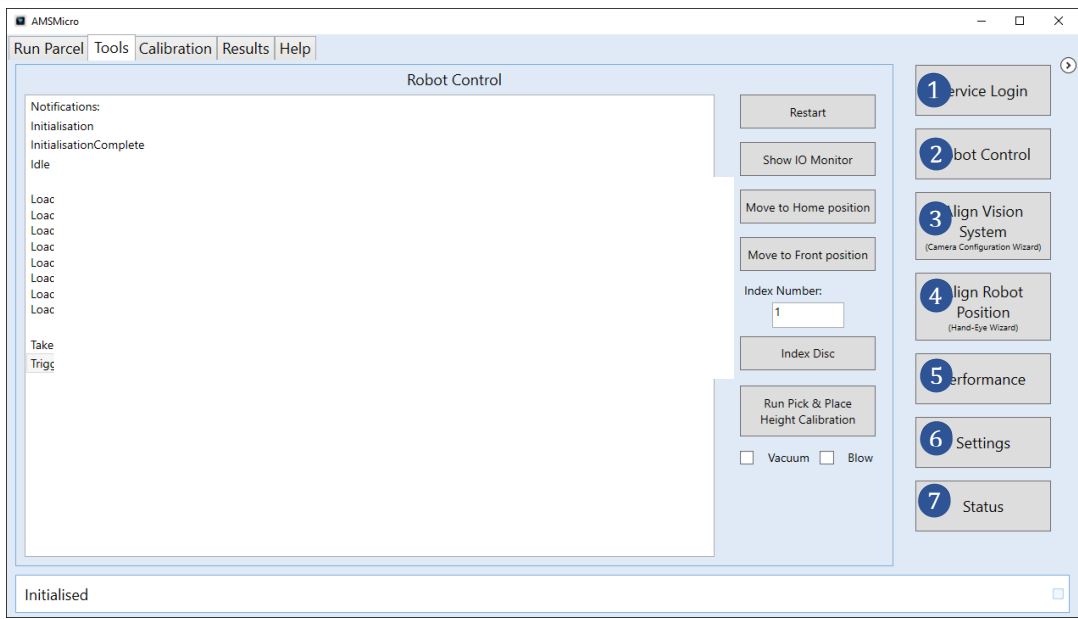


Figure 39 – Tools Tab

When the Tools tab is first selected the Robot Control Screen ② is displayed by default. The main pane shows a running log of the current activity.

The following sections provide further detail on each of the available views.

8.2.1 SERVICE LOGIN VIEW

Clicking on this will display a screen which allows the user to enter a username and password.



CAUTION

SERVICE LOGIN MUST ONLY BE USED BY DE BEERS TECHNICAL SUPPORT

8.2.2 ROBOT CONTROL VIEW

Selecting The Robot Control view from the Tools menu displays the screen shown in Figure 37.

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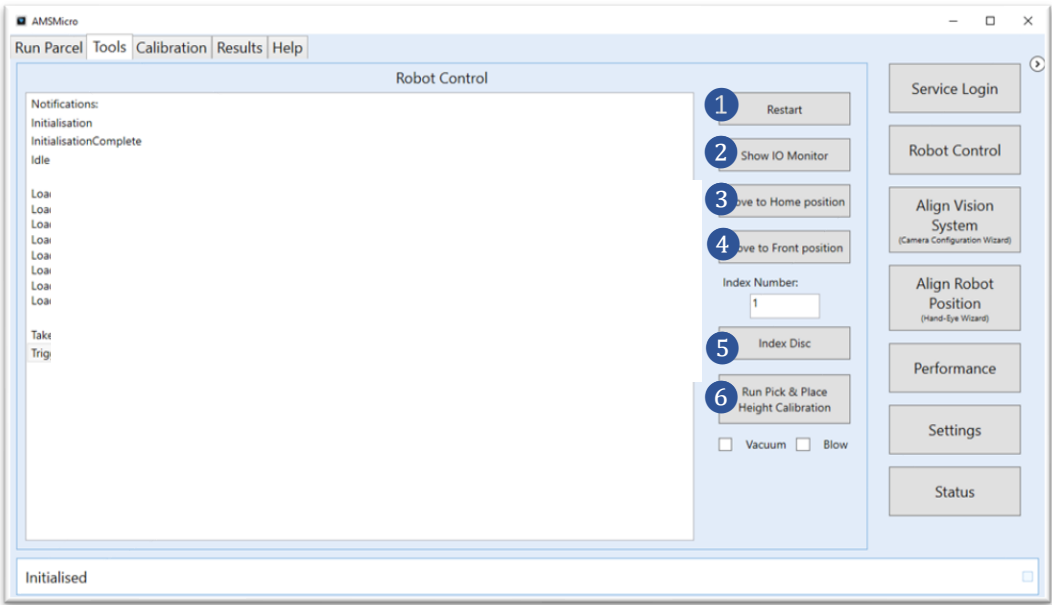


Figure 40 – Robot Control Functions

Within this view a number of different functions, shown as ① to ⑥ in Figure 40, may be selected. These are described in the following sections.



THE FRONT DOOR MUST BE CLOSED TO ALLOW OPERATION OF ANY FUNCTION WHICH CAUSES THE ROBOT TO MOVE.

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8.2.2.1 Show I/O Monitor Function



CAUTION

THE I/O MONITOR MUST BE USED ONLY AS DIRECTED BY DE BEERS TECHNICAL SUPPORT

When selected, a window similar that shown in *Figure 41* appears. This displays the status of the robot inputs (left side) and robot outputs (right side).

Information in this window may be useful when diagnosing a fault. The circles in the Status columns will appear green if that input or output line is active. For example, in *Figure 41* the “Disc Power Drive” output is green, showing that it is active.

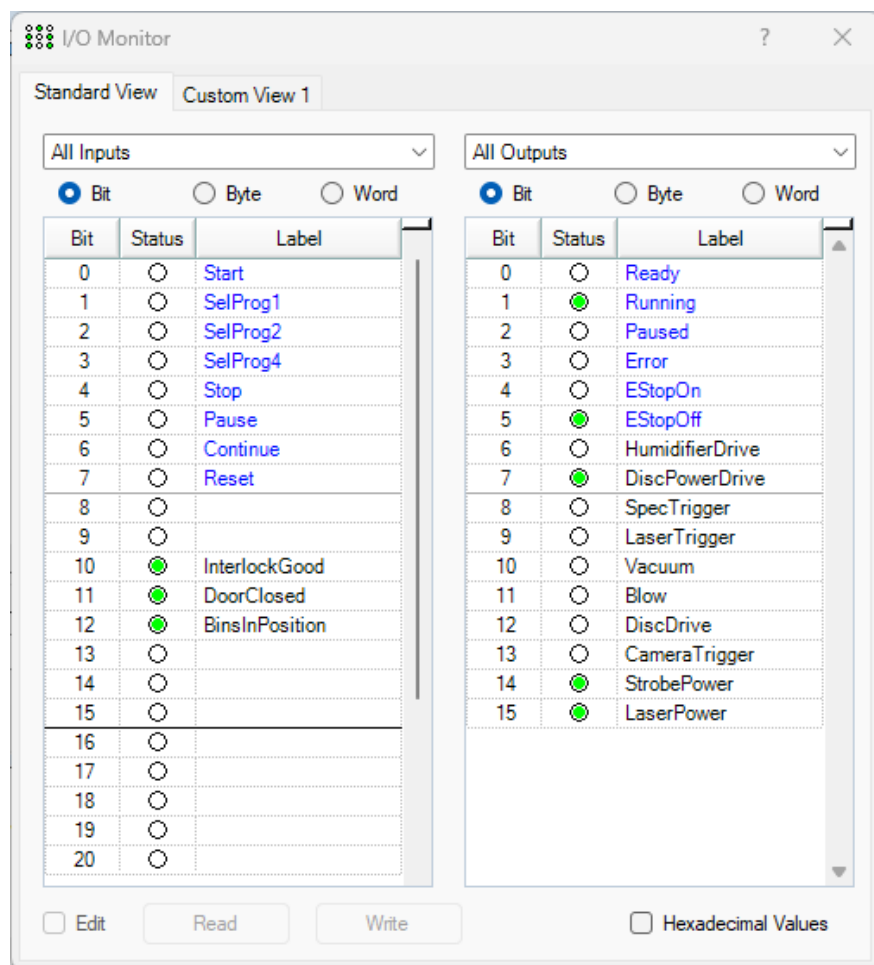


Figure 41 – I/O Monitor

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8.2.2.2 Reset Robot Function



CAUTION

USE ONLY AS DIRECTED BY DE BEERS TECHNICAL SUPPORT

8.2.2.1 Move to Home Position Function

Pressing this button causes the robot to move to the 'Home' position. This moves the robot backwards and away from the feeder and disc.

8.2.2.2 Move to Front Position Function

Pressing this button causes the robot to move forward. This allows easy access for nozzle maintenance and replacement. See section 9.6.

8.2.2.3 Index Number/Index Disc Function

There are forty positions on the disc where stones can be placed by the robot. Entering a number between 1 and 40, *Figure 42 – 1*, and then clicking the Index Disc button will advance the disc by the that number of positions.

8.2.2.4 Pick and Place Height Calibration Function

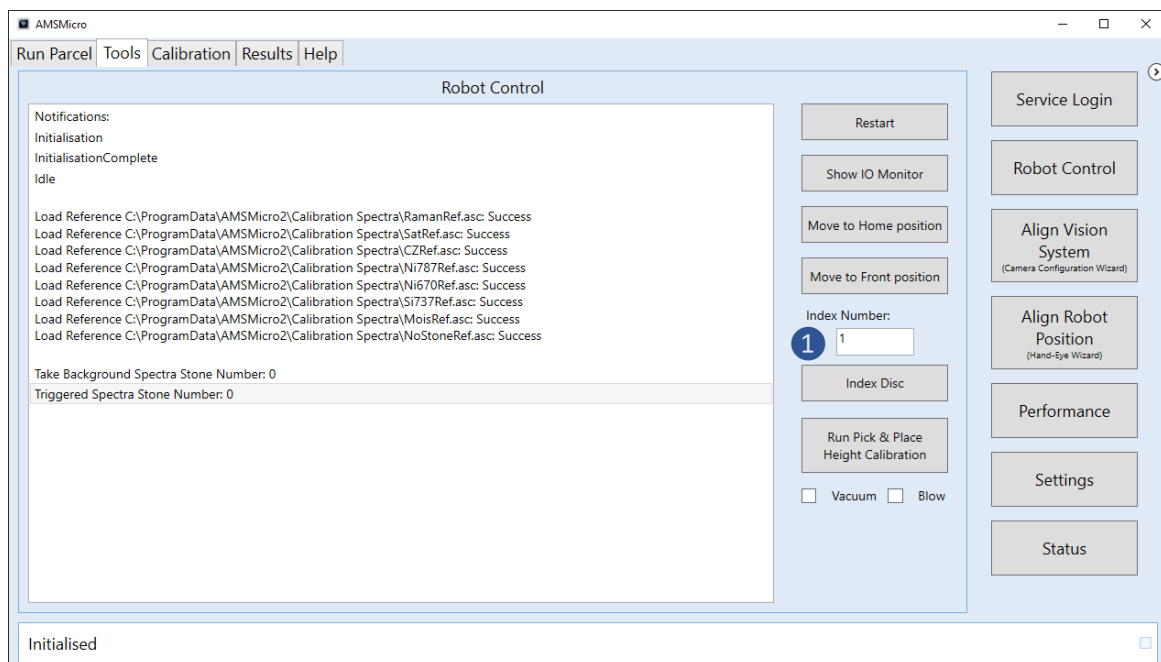


Figure 42 – Pick and Place Height Calibration Screen

See section 9.5.1 for further details.

8.2.2.5 Vacuum and Blow Checkboxes

These checkboxes may be used to verify correct operation of the vacuum and blow functions. They should be enabled in turn - not together - whilst holding a hand beneath the nozzle. (Note that the vacuum is weak and may be difficult to detect. It is easier to listen for an increased replenishment frequency of the vacuum reservoir).

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THE BLOW FUNCTION IS A GOOD WAY TO CHECK IF THE NOZZLE HAS BECOME BLOCKED.

8.2.3 ALIGN VISION SYSTEM VIEW

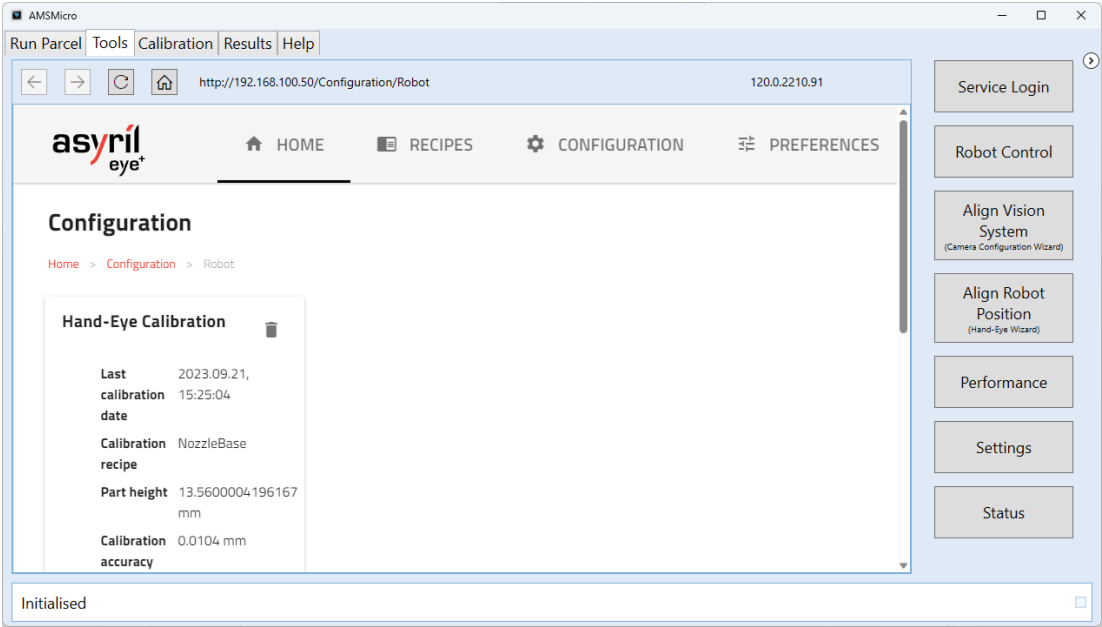


Figure 43 – Align Vision System Screen



CAUTION

THIS FUNCTION MUST BE USED ONLY BY DE BEERS TECHNICAL SUPPORT

8.2.4 ALIGN ROBOT POSITION VIEW

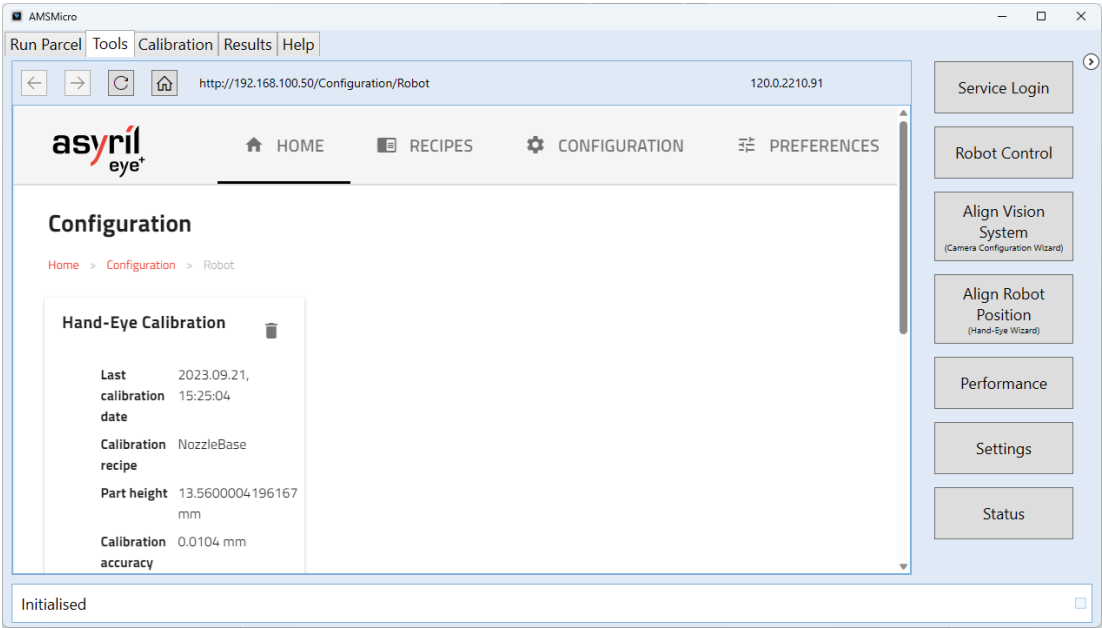


Figure 44 – Align Robot Position Screen

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CAUTION

THIS FUNCTION MUST BE USED ONLY BY DE BEERS TECHNICAL SUPPORT

8.2.5 PERFORMANCE VIEW

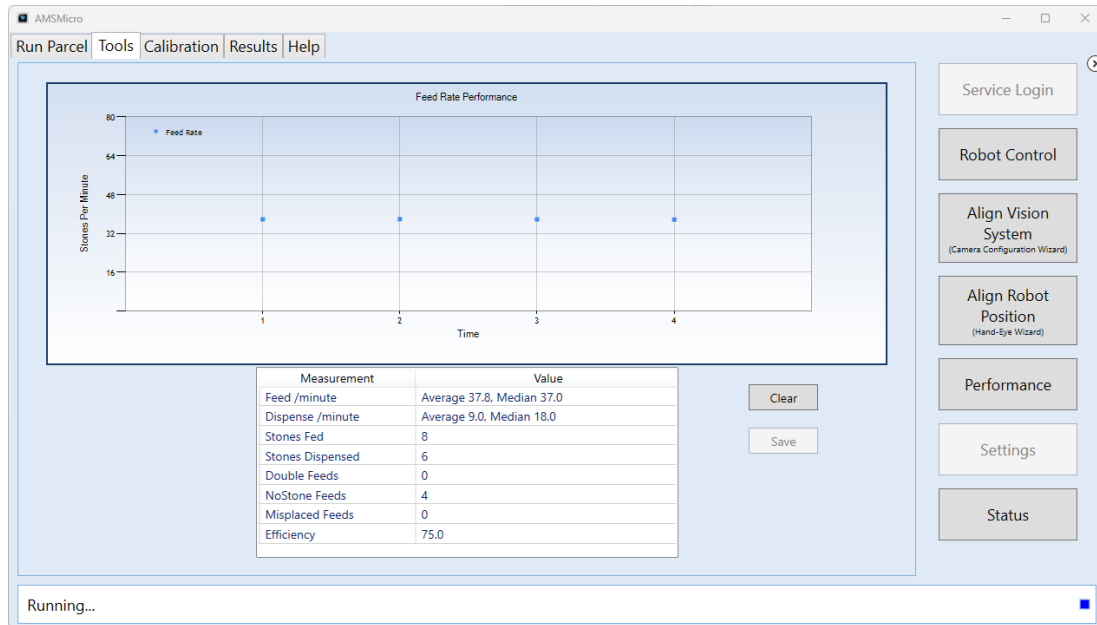


Figure 45 – Performance Screen

This presents a summary of several performance metrics for AMSMicro. Some of these are useful only to servicing personnel but others may be of interest to users. All are detailed below.

Metric	Description
Feed/minute	Median ⁸ and average pick and place attempts per minute by the robot. This will include any stones which were not picked, dropped or unsuitable for measurement as well as those which were measured successfully.
Dispense/minute	Median and average of the number of stones dispensed to either the pass, refer, lab grown or non-diamond bins per minute. It is an indication of the useful feed rate of the machine since a valid measurement has been performed on each of the stones in these bins.
Stones Fed	The total number of stones fed.
Stones Dispensed	The total number of stones dispensed any bin other than purge.
Double Feeds	Occasionally the robot may pick up more than one stone. These double feeds cannot be measured and dispensed and are counted here. Each double feed (which may in fact be two or more stones) is counted will cause this count to increase by one.
No Stone Feeds	The total number of feeds for which a stone was not detected
Misplaced Feeds	The total number of feeds for which a stone was detected but which was too far out of position to allow valid measurements to be taken.

⁸ For systems which build up speed at the start of a run and then slow at the end, the median is a better measure of sustained performance of the system than the average. The median excludes outlying values such as will be seen during the start and stop phases of a run.

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Metric	Description
Efficiency	Stones Dispensed (see above) divided by Stones Dispensed + Purge Count expressed as a percentage.

8.2.6 SETTINGS VIEW

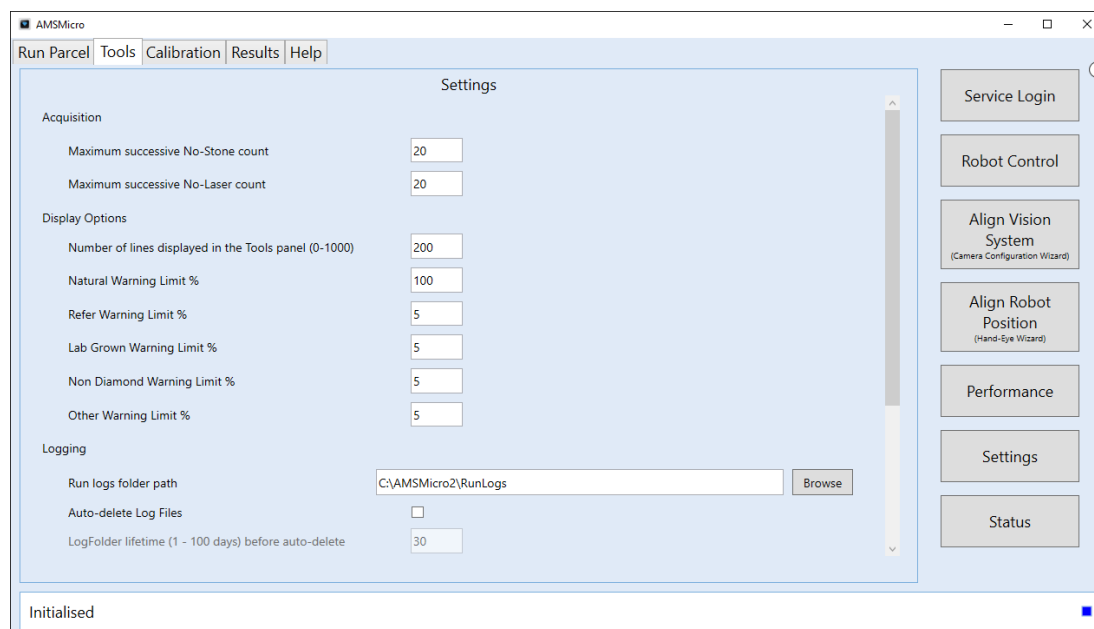


Figure 46 – Settings Screen

The following table details of the available settings:

Setting	Description
Maximum Successive No-Stone Count	The machine will stop automatically if the entered number of stones are not seen by the imaging system. If this count is regularly exceeded is most likely due to a pick and place issue. Change this value only as directed by De Beers Technical Support.
Maximum Successive No-Laser Count	The machine will stop automatically if the entered number of stones are not seen by the spectroscopic system. If this count is regularly exceeded it is likely to suggest a place position issue. Change this value only as directed by De Beers Technical Support.
Number of Lines Displayed in the Tools Panel	This controls how many lines are displayed in the status log which is presented in the Robot Control View (section 8.2.2).
Natural Warning Limit %	The percentage indication shown against the relevant count ⁹ on the front panel can be set to change colour if this value is exceeded.
Refer Warning Limit %	
Lab Grown Warning Limit %	
Other Warning Limit %	
Run Logs Folder Path	This controls where run logs are stored. It should not be set to a network or removable drive.

⁹ 'Other' is currently unused. This is labelled as 'Spare' on the machine.

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Setting	Description
Auto Delete Log Files	This should normally be selected to conserve disk space.
Log Folder Lifetime Before Auto Delete	When the above option is selected, log files older than the entered number of days will be automatically deleted.
Log Events to File	These should normally be checked. They are useful for support purposes.
Log Events to CSV	
Log Summary in CSV	
Log Raw Data	This will consume a large amount of disk space and should not normally be checked. It should be used only as directed by De Beers Technical Support.
Maximum Number of Raw Data Sets	This setting should be used only as directed by De Beers Technical Support.
Commissioned Date	Indicates the date and time that the commissioning of the machine was completed.

8.2.7 STATUS VIEW

The Status View (*Figure 47*) displays the status of AMSMicro. Information shown here includes the serial numbers and software versions of relevant internal subsystems as well as some instantaneous data such as the temperature, air pressure and humidity in the stone handling area.

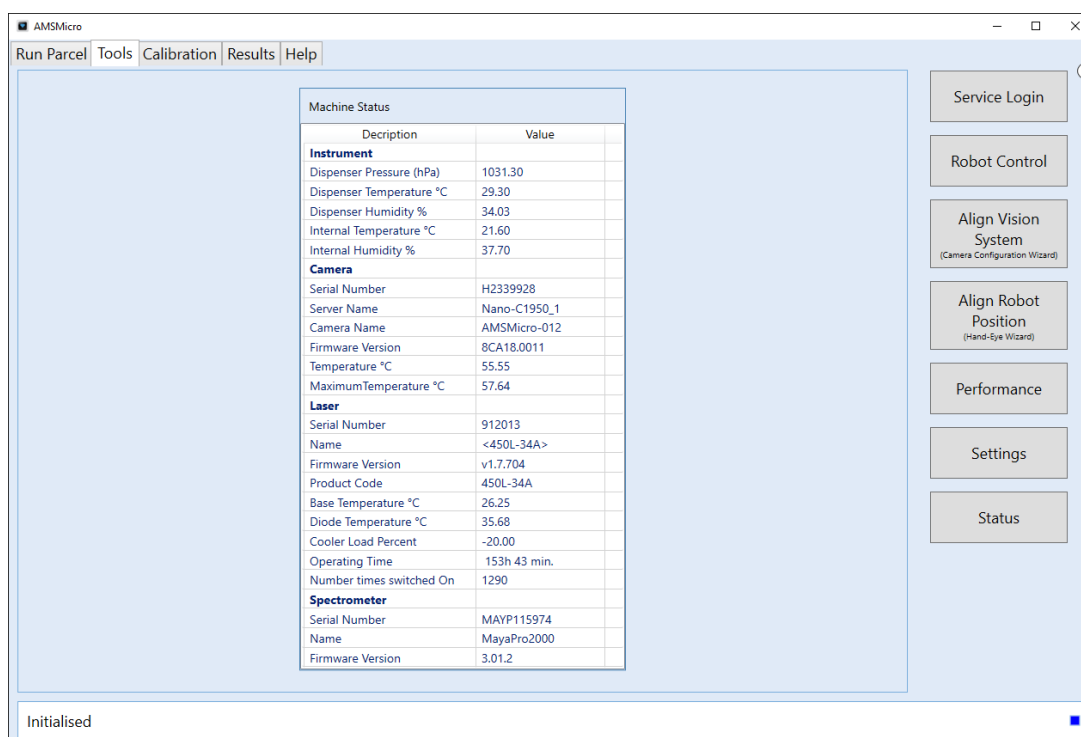


Figure 47 – Status View

8.3 CALIBRATION TAB

This tab shows the results of the last AMSMicro calibration check. By default, the calibration history is displayed:

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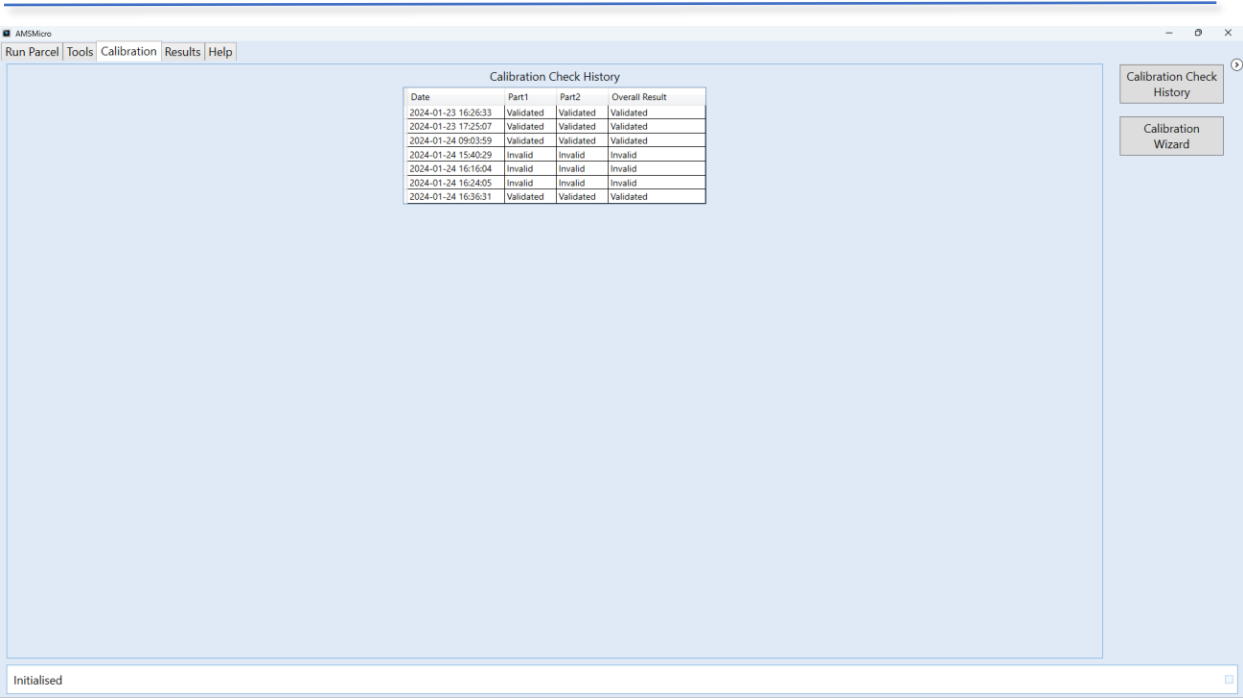


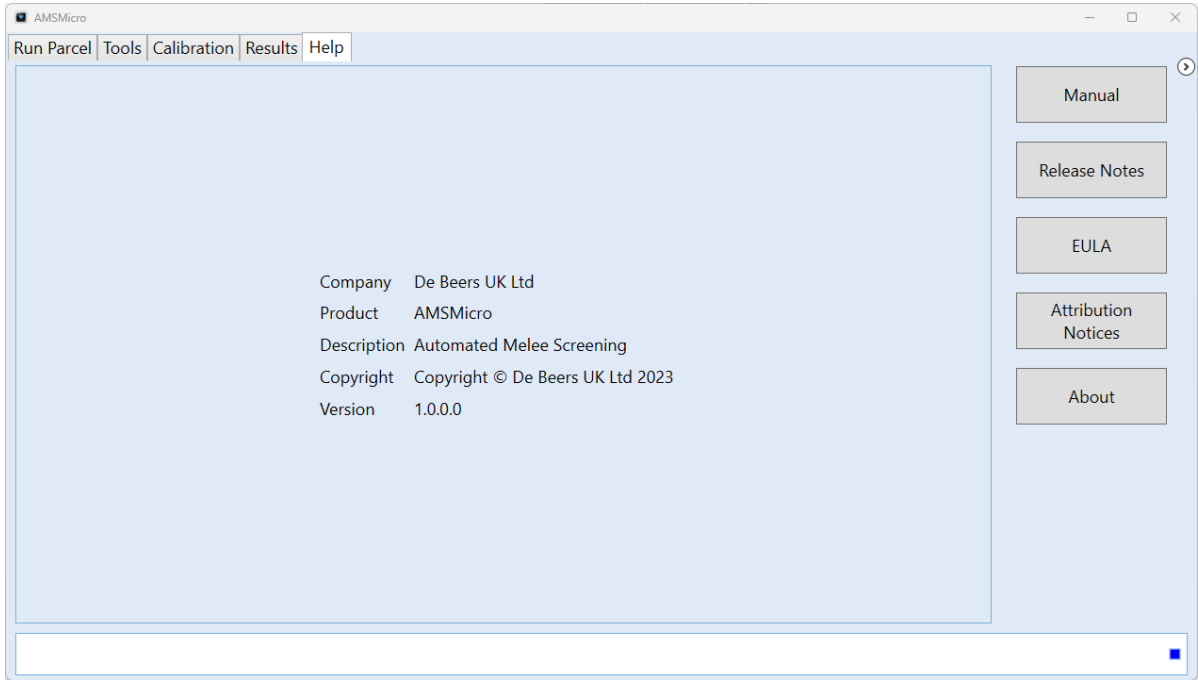
Figure 48 - Calibration Tab

8.4 RESULTS TAB

This screen both summary and detail reports of the screening run. Once either the summary or detail report is displayed it may be saved as a PDF file if required.

8.5 HELP TAB

This tab provides access to AMSMicro documentation and notices.



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Figure 49 – Help Tab

8.5.1 ABOUT VIEW

When the help tab is first selected the 'About' view is displayed. This provides information about the installed AMSMicro software including its version number.

8.5.2 RELEASE NOTES VIEW

This view provides details of the changes which feature in the current and previous releases of the AMSMicro software.

8.5.3 EULA VIEW

This displays the End User License Agreement (EULA) for the AMSMicro software.

8.5.4 ATTRIBUTION NOTICES VIEW

This provides attribution information for software components which are used both by the main AMSMicro software and elsewhere in the AMSMicro machine.

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9 USER MAINTENANCE

9.1 PERIODIC MAINTENANCE

This section outlines the requirements for periodic maintenance of AMSMicro to ensure continued efficient operation. The frequencies given below are for typical use; heavy usage will require more frequent inspection and maintenance.



CAUTION

IF AMSMICRO IS UNLIKELY TO BE USED FOR MORE THAN A WEEK: TO REDUCE THE POSSIBILITY OF LIMESCALE BUILD-UP AND BIOLOGICAL CONTAMINATION THE HUMIDIFIER BOTTLE SHOULD BE EMPTIED AND THOROUGHLY DRIED. ANY REMAINING WATER IN THE HUMIDIFIER MODULE SHOULD ALSO BE DISCARDED AND THE HUMIDIFIER MODULE THOROUGHLY DRIED. (SEE ALSO SECTION 9.2).

Period	Maintenance Task
After Screening Run	Complete the Machine Clean Down Procedure in section 7.3.2.
Daily	Check that the front door operates smoothly and that the panels are undamaged. Ensure that the interlock and latch mechanism engage smoothly and that a 'click' is heard when the front door is closed.
	Remove any dust from the interior of the machine. A soft, lint-free cloth is best for this. A manual puff duster can also be used. Do not use aerosol air dusters as the propellant in these can leave deposits on surfaces.
	Change the water in the humidifier bottle (section 0) and empty any remaining water in the humidifier.
Weekly	The humidifier module and bottle require cleaning and sterilizing on a weekly basis- regardless of usage to reduce the possibility of limescale build-up and biological contamination. The humidifier module has been designed to be easily removed and replaced to facilitate this. Simply unplug the humidifier and remove it from the machine for sterilization. Ensure also that the catch tray on which the humidifier module sits is also emptied and sterilized. See section 9.2 for details of how to remove and fill the bottle.
	Clean the stone path (section 9.3).
	Inspect the nozzle (section 9.4).
	Check that the levelling feet are fully deployed and that all four castors are off the ground.
Monthly	Verify the colour calibration (section 9.5.2).
	Check that the machine is level using a spirit level (not supplied) on the base plate of the interior of AMSMicro:

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Period	Maintenance Task
	1) From left to right in front of the accessories drawer (Error! Reference source not found. - 15). 2) From front to back to the left of the dispenser bins (Error! Reference source not found. - 6).

9.2 HUMIDIFIER MAINTENANCE



USE ONLY DEIONISED WATER WHEN FILLING. UNDER NO CIRCUMSTANCES SHOULD TAP WATER BE USED. IT IS A GOOD IDEA TO CONDUCT THE FILLING OPERATION OVER A SINK IN CASE OF SPILLS.

REFER ALSO TO THE HUMIDIFIER MANUFACTURER'S INSTRUCTIONS [HERE](#):



(https://res.cloudinary.com/beurer/raw/upload/f_auto/v1592420992/product-and-content-live-uk/ffb59aa909d260637be5b4cef9737c8e5c900b4531762fd6c92bfa7ffc12fd75.pdf)



CAUTION

IF AMSMICRO IS UNLIKELY TO BE USED FOR MORE THAN A WEEK: TO REDUCE THE POSSIBILITY OF LIMESCALE BUILD-UP AND BIOLOGICAL CONTAMINATION THE HUMIDIFIER BOTTLE SHOULD BE EMPTIED AND THOROUGHLY DRIED. ANY REMAINING WATER IN THE HUMIDIFIER MODULE SHOULD ALSO BE DISCARDED AND THE HUMIDIFIER MODULE THOROUGHLY DRIED. SEE SECTION 9.2).

9.2.1 WATER BOTTLE FILLING PROCEDURE



USE ONLY DEIONISED WATER WHEN FILLING. UNDER NO CIRCUMSTANCES SHOULD TAP WATER BE USED. IT IS A GOOD IDEA TO CONDUCT THE FILLING OPERATION OVER A SINK IN CASE OF SPILLS.

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Figure 50 – Humidifier Water Bottle Filling

- 1) Remove water bottle (see *Figure 50 – 2*) from the Humidifier Module (see *Figure 50 – 3*). When doing this it is helpful to cup another hand underneath to catch any drips which may fall from the valve.
- 2) Turn the bottle over to access the combined screw top and valve cap.
- 3) Unscrew the combined screw top and valve cap **1**.
- 4) Fill the bottle with **de-ionised** water.
- 5) Replace the combined screw top and valve cap.
- 6) Carefully turn the bottle over and check that no leaks are present.
- 7) Replace the bottle in top of Humidifier Module.

9.2.2 CLEANING PROCEDURE

Refer to the humidifier manufacturer's instructions (supplied, section 4.8).



THE HUMIDIFIER MANUFACTURER'S INSTRUCTIONS ARE ALSO AVAILABLE [HERE](https://res.cloudinary.com/beurer/raw/upload/f_auto/v1592420992/product-and-content-live-uk/ffb59aa909d260637be5b4cef9737c8e5c900b4531762fd6c92bfa7ffc12fd75.pdf):

(https://res.cloudinary.com/beurer/raw/upload/f_auto/v1592420992/product-and-content-live-uk/ffb59aa909d260637be5b4cef9737c8e5c900b4531762fd6c92bfa7ffc12fd75.pdf)

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9.3 CLEANING THE STONE PATH

To maintain reliable feed performance, it is important to regularly clean the surfaces which stones touch as they pass through the machine. Over time, these will accumulate grease deposits from general handling and from stones.



NOT TOUCHING THE STONE HANDLING SURFACES SUCH AS THE INTERIORS OF THE HOPPER AND FEEDER TRAY, AND THE OUTER EDGE OF THE DISC WILL GREATLY REDUCE THE NEED TO CLEAN THE MACHINE AND PROMOTE EFFICIENT STONE FEEDING. WITH CARE, IT IS QUITE POSSIBLE TO REMOVE AND REPLACE ITEMS WITHOUT TOUCHING THE SURFACES WHICH THE STONES TOUCH.



CAUTION

ENSURE ALL RELEVANT CHEMICAL HANDLING PROCEDURES AND PRECAUTIONS ARE OBSERVED WHEN USING ISOPROPYL ALCOHOL, THAT IT IS STORED IN AN APPROPRIATE CONTAINER AND CHEMICAL CABINET, AND THAT SUFFICIENT VENTILATION IS PROVIDED.



CAUTION

ENSURE SUITABLE PROTECTIVE FOOTWEAR IS WORN WHEN REMOVING AND REPLACING THE DISPENSER.

Using isopropyl alcohol and a lint free cloth:

- Clean the interior surfaces of the hopper and feeder tray.
- Remove the disc and clean the top outer 3cm circumference.
- Clean the inside of the dispense bins.

9.4 CLEANING AND CHECKING THE NOZZLE

Using isopropyl alcohol and a non-shedding swab:

- Remove the nozzle (section 9.6.1) and clean the tip.
- Ensure that the interior of the nozzle inside the outer shroud and the front edge of the shroud and insert are cleaned.
- Ensure that the countersunk hole in the centre of the nozzle is cleaned. Using swab with a pointed end will make this task much more effective.



CLEANING THE NOZZLE IS A GOOD OPPORTUNITY TO INSPECT THE NOZZLE. SEE SECTION 9.6.2.

9.5 CALIBRATION PROCEDURES

When AMSMicro is first installed it is important to recheck the calibration of the stone feeding system. This has two aspects: the setup of the Asyrl Eye+ camera, and the robot to feeder vision

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system calibration referred to as “Hand-Eye” calibration. These calibrations should only be carried out by a trained technician.

9.5.1 ROBOT HEIGHT CALIBRATION

When any activity is undertaken which may affect the pick and place heights it is important to recalibrate the height settings of the robot.

This is most likely to be required when parts are replaced due to excessive wear. For example, the nozzle will require periodic replacement and in the much longer term the disc may also require replacement.



REMOVAL AND REPLACEMENT OF THE SAME NOZZLE OR REMOVAL AND REPLACEMENT OF THE SAME DISC, IF CARRIED OUT CORRECTLY, WOULD NOT NORMALLY REQUIRE A ROBOT HEIGHT CALIBRATION TO BE COMPLETED.



CAUTION

ENSURE THAT NO STONES REMAIN ON THE DISC OR IN THE FEEDER TRAY BEFORE PERFORMING A ROBOT HEIGHT CALIBRATION

- 1) Ensure that no stones remain on the disc or in the feeder tray.
- 2) Close the front door of the machine.
- 3) Select the Robot Height Calibration in the Robot Control View on The Tools tab (section 8.2.2.4).
- 4) The function will take several minutes to run. An indication of progress is given on screen.
- 5) The results will be compared against pre-set limits. If any result falls outside these limits an error will be reported. Possible errors may be caused by:
 - a. The nozzle not being properly installed.
 - b. The feeder tray not being properly installed.
 - c. The disc not being properly installed.

9.5.2 COLOUR CALIBRATION VALIDATION

On a monthly basis a colour calibration validation should be carried out by the user to verify the performance of the imaging measurement system.

To do this:

- 1) Go to the ‘Calibration’ tab of the AMSMicro program and select the ‘Calibration Wizard’ function on the right-hand side:

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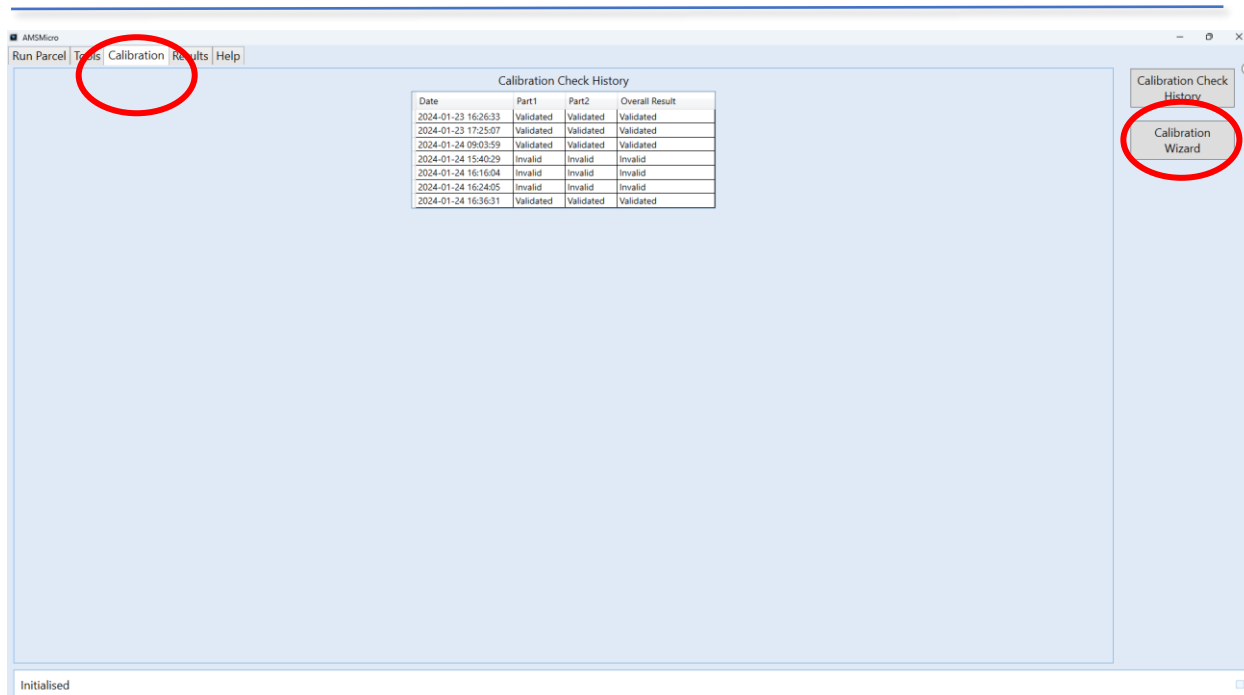


Figure 51 – Calibration Tab

- 2) Follow the instructions in the tabs on the left hand side of the window from top to bottom:



Figure 52 – Starting the Colour Calibration Validation Process

- 3) Remove the Bin (Dispenser) Assembly – see Figure 29.



CAUTION

ENSURE SUITABLE PROTECTIVE FOOTWEAR IS WORN WHEN REMOVING THE DISPENSER ASSEMBLY.

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- 4) Remove the Disc – see *Figure 31* – and fit the Colour Calibration and Verification Disc (*Figure 53*). The stones insert (*Figure 54*) fits into the largest cutout in the disc and is secured with magnets. Prior to fitting, the black cover should be removed by sliding it in the direction shown in the arrow to expose the stones. Use the Disc Clamp Assembly to secure the Colour Calibration and Verification Disc to the machine. It is not necessary to replace the dispenser assembly while using the calibration disc.



Figure 53 – Colour Calibration and Verification Disc

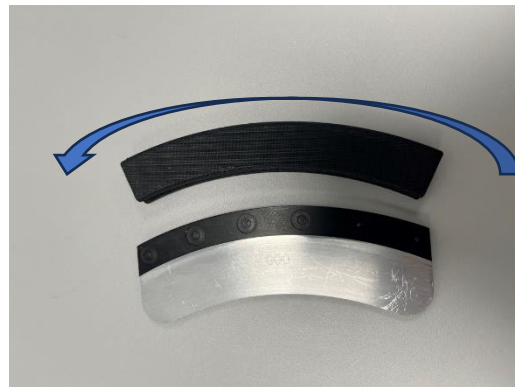


Figure 54 – Removing Sones Insert Cover

- 5) Align the first stone on the Colour Calibration Disc in the centre of the yellow circle on the screen. Use the buttons at the bottom of the window to adjust the position of the Disc until the stone is centred. The buttons have a decreasing amount of adjustment from left to right. **It is essential that the first stone of the set¹⁰ (rather than any other stone) is aligned** A good indication is that the edge of the insert is visible (*Figure 55*):

¹⁰ When the calibration disc is installed with all stones clear of the imaging measurement system, the 'first' stone is the stone which appears first as the disc is indexed round.

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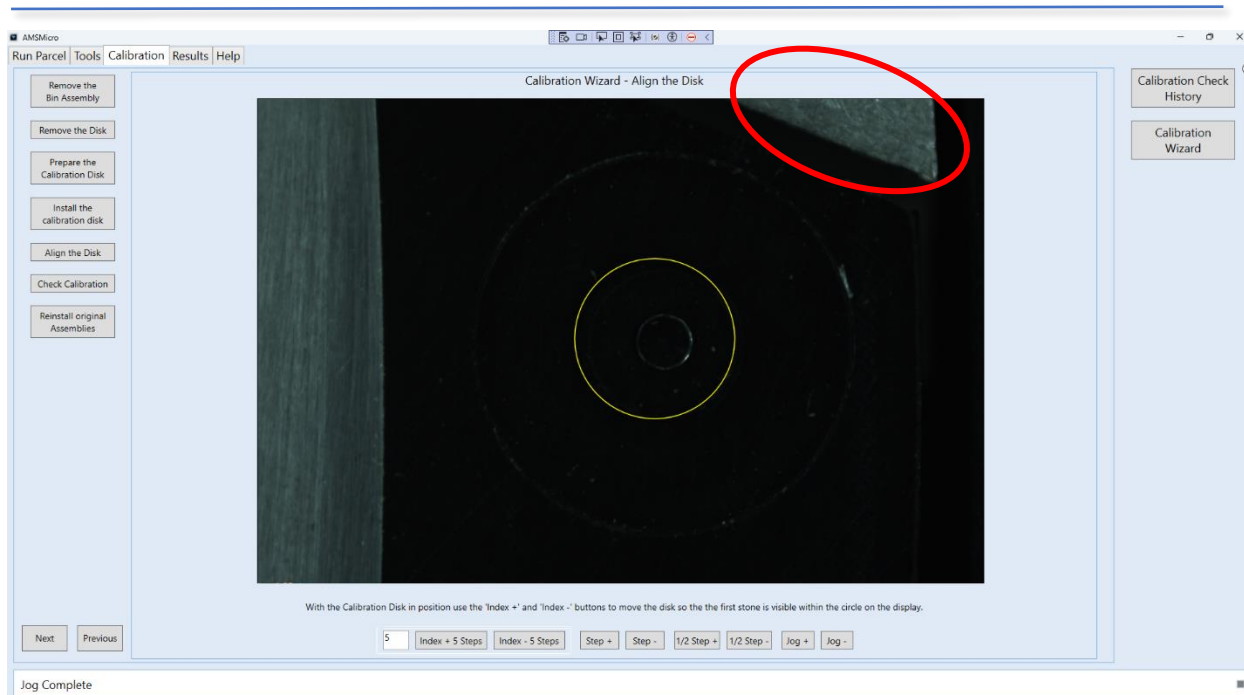


Figure 55- Calibration Wizard Disk Alignment

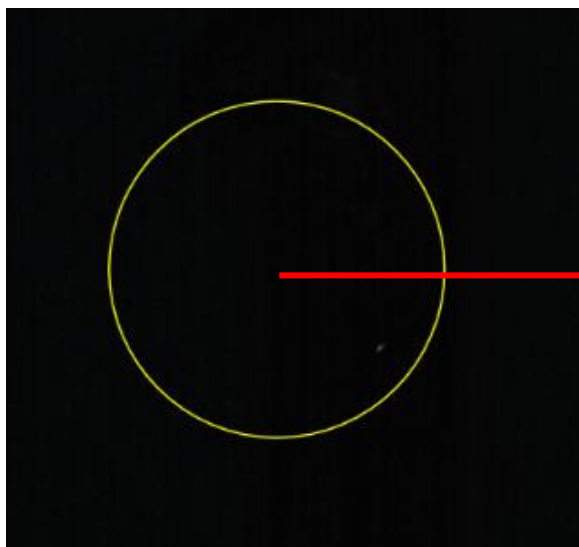


Figure 56 – Alignment Circle

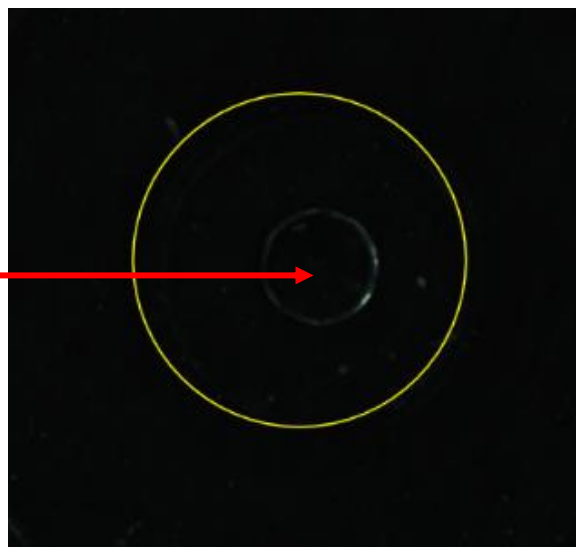


Figure 57 – Centred Stone

- 6) Once the first stone is aligned in the circle, select the 'Run Calibration' button at the bottom of the window; the calibration validation procedure will start.

When the calibration validation process is complete, the two indications at the bottom of the screen should become green (highlighted in Figure 58).

- a. If the calibration could not be validated and the indications at the bottom of the screen do not turn green, then the calibration of AMSMicro was not validated. Check first that the alignment of the first stone (step 5) above) was correctly completed and reattempt the calibration verification check. If these steps are unsuccessful contact De Beers' Technical Support for further assistance (section 14).

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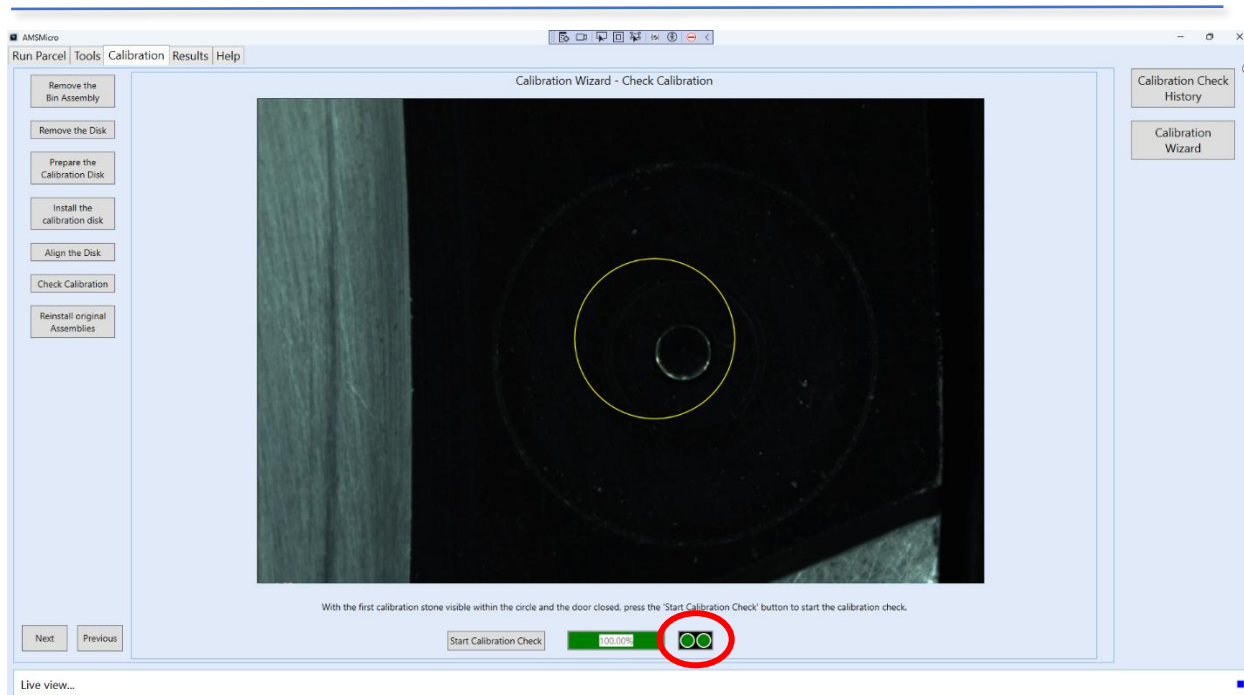


Figure 58 – Calibration Validation Success

- 7) Once the Calibration Validation is complete:
- Remove the calibration disc.
 - Remove the stones insert from the calibration disc.
 - Refit the protective cover over the stones insert.
 - Refit the normal disc.
 - Refit the Dispenser Assembly.



CAUTION

ENSURE SUITABLE PROTECTIVE FOOTWEAR IS WORN WHEN REPLACING THE DISPENSER ASSEMBLY.

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9.6 NOZZLE INSPECTION, CLEANING AND REPLACEMENT

This inspection and cleaning procedure is to be followed regularly to check the condition of the nozzle and its filter. The cleanliness of the stones being used will determine how quickly the filter will need replacing.



WHEN HANDLING THE NOZZLE, AVOID TOUCHING ITS TIP AS THIS WILL DEPOSIT FINGER GREASE, CAUSING STONES TO STICK TO IT.

9.6.1 NOZZLE REMOVAL

- 1) Ensure that the front door of the machine closed.
- 2) Click on the 'Tools' tab and then select the 'Robot Control' view.
- 3) Select the 'Move Nozzle to Front' function. The robot will move to the nozzle change position at the front of the machine. The status bar at the bottom of the screen will show 'Moving to Front Position...' While this is taking place the robot movement buttons will be disabled.
- 4) Once the robot movement has been completed the status bar at the bottom of the screen will show 'Robot at Front Position' and the robot movement buttons will be enabled.
- 5) Open the front door and remove the nozzle for inspection:
 - a. Use the supplied 2mm hex key to loosen the two grub screws (circles in red) at the base of the robot head.
 - b. While doing this, hold the nozzle without touching the tip to prevent it getting dirty. It will drop out once the screws are loosened sufficiently. It should not be necessary to completely remove the screws.

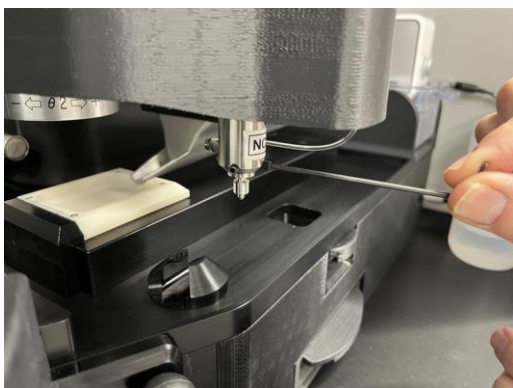


Figure 59 – Loosening Grubscrews



Figure 60 – Removing Nozzle

9.6.2 NOZZLE INSPECTION AND CLEANING

- 1) Remove the filter from the nozzle and check that it is clean; it should appear white and not be discoloured. It may be necessary to tap the nozzle on a hard surface to remove the filter, but it is important that the filter is replaced in the same orientation if it is reused. The side closest to the tip may appear darker as this is where debris is trapped. If necessary, replace with a fresh filter.

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Figure 61 –Nozzle Fitted with Clean Filter



ENSURE THAT THE FILTER IS REPLACED IN THE SAME ORIENTATION AS IT WAS WHEN IT WAS REMOVED. IF IT IS INVERTED, PREVIOUSLY TRAPPED DEBRIS MAY BE DRAWN INTO THE VACUUM SYSTEM.



DO NOT ATTEMPT TO CLEAN THE FILTER- IF IT APPEARS DIRTY IS SHOULD BE REPLACED.



CAUTION

ENSURE ALL RELEVANT CHEMICAL HANDLING PROCEDURES AND PRECAUTIONS ARE OBSERVED WHEN USING ISOPROPYL ALCOHOL, THAT IT IS STORED IN AN APPROPRIATE CONTAINER AND CHEMICAL CABINET, AND THAT SUFFICIENT VENTILATION IS PROVIDED.

- 2) Using a non-shedding swab and isopropyl alcohol, thoroughly clean the interior of the nozzle inside the outer collar (this is at the very tip of the nozzle, as shown in *Figure 62*) as well as the front and outer edges of the collar:

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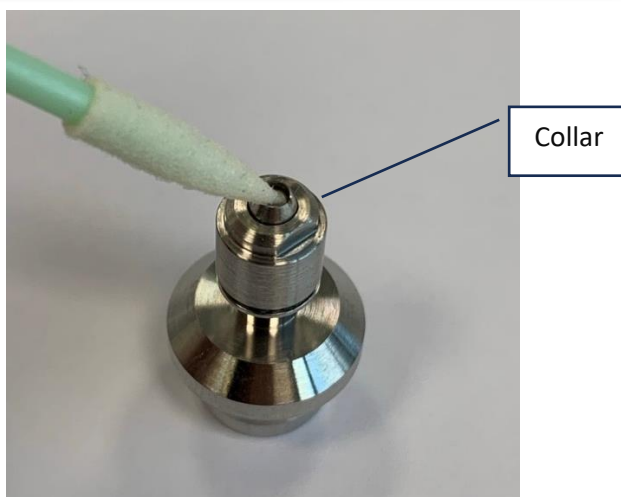


Figure 62 - Cleaning the Nozzle

- 3) With a clean pair of tweezers check that the collar can be depressed slightly. It should not require great force to move. If significant effort is required or no movement is observed the nozzle should be replaced. If the collar sticks when depressed or does not return to its extended position smartly the nozzle should be replaced.



Figure 63- Checking the Operation of the Collar



DAMAGED NOZZLES MAY BE REFURBISHED. CONTACT DE BEERS TECHNICAL SUPPORT (SECTION 14) FOR FURTHER DETAILS.

- 4) Hold the nozzle up to the light with the larger diameter end closest to the observer to check that the hole in the centre is not blocked.
- 5) Using a 10x loupe inspect the centre of the tip of the nozzle for damage. A degree of pitting is acceptable but if it is significant such that the countersunk hole in the centre is not visible or is badly deformed then the nozzle should be replaced.

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9.6.3 NOZZLE INSTALLATION



THE WHITE FILTER MUST BE IN POSITION BEFORE INSTALLING THE NOZZLE.

DO NOT TOUCH THE TIP OF THE NOZZLE WHILE INSTALLING IT.

- 1) When installing the nozzle into the robot:
 - a. Ensure that white filter is in place in the nozzle. (See also section 9.6.2).
 - b. Before inserting the nozzle into the robot ensure that the slot at the bottom of the nozzle is roughly aligned from (machine) side to side rather than front to back. *Do not touch the tip of the nozzle- simply twist the whole nozzle prior to inserting it.*
 - c. Insert the nozzle into the robot and, whilst pushing the nozzle firmly upwards with one hand, tighten the two grub screws. Take care not over tighten them.
- 2) Close the front door of the machine.
- 3) Select the 'Move Nozzle to Home' function. The status bar at the bottom of the screen will show 'Moving to Home Position...' While this is taking place, the robot movement buttons will be disabled.
- 4) If a different nozzle from the one previously removed has been installed a Robot Height Calibration should be completed (Section 9.5.1).

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9.7 TROUBLESHOOTING

Symptom	Possible Cause	Remedy
AMSMicro will not turn on.	Power not turned on at wall	Turn on wall outlet.
	Power not turned at rear panel.	Turn on rear panel switch.
	Blown fuse in plug.	Test fuse and replace if necessary.
	Blown fuse in AMSMicro power inlet.	Test fuses and replace if necessary (section 5.4).
AMSMicro will not initialise	Door open	Close door.
	Bin(s) out of position	Ensure all bins are fully inserted-including the stone reclaim bin.
	Interlock connection missing	Ensure that either a blanking plug or a connection to an external room interlock system is present on the rear panel.
	Stones on disc	Clear stones from disc. Note that the disc may appear clear but a single stone beneath the laser system could give rise to this symptom. Use the purge function (section 8.1.4) to clear the disc.
Stones Poorly Placed	Nozzle slot misaligned	See section 9.6.3.
	Disk incorrectly installed	See section 7.3.2.
	Pick and place height calibration required	See section 8.2.2.4.
Reduced Feed Rate	Cleaning required	See section 8.
	Stones not sieved	An excessively wide range of stone sizes will cause the feeder tray to become filled with unpicked stones. Ensure that the maximum diameter variation of the stones in a parcel is no greater than 0.05mm and that the stones are suitable for use in AMSMicro. (See section 1).
	Stones left in feeder tray	These stones were unsuitable for picking. They may be the wrong size or shape. Stones may be

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Symptom	Possible Cause	Remedy
		stuck together. There may also be debris present which will not be picked. With small debris there is a danger that this may be sucked into the nozzle and cause a blockage. It is very important to ensure that only clean stones of the correct size range are used with AMSMicro, and that no debris is present in the parcel. A good way to do this is to sieve the parcel.
	Stones require cleaning	If stones are seen to stick to the inner surfaces of the machine or each other then it is likely that they or the machine surfaces require cleaning. Towards the end of a run stones may be seen to be sticking together in the tray view on the Run Parcel tab (section 8.1.5). If it is suspected that dirty stones have been fed through the machine, the internal surfaces of the stone handling areas should be cleaned. See 7.1.1.
	Poor feed rate	Check stone size selection. Selecting the wrong stone size will severely impact the feed rate.
	Blocked nozzle (Robot)	From time to time the nozzle that picks and places the stones may become blocked or damaged and fails to operate correctly. When this happens, it is necessary to remove the nozzle from the robot for inspection, cleaning, or renewal (see 9.6). NOTE: A white crystalline filter is fitted into the top of the nozzle. Ensure that this is fitted when the nozzle is reinstalled.

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Symptom	Possible Cause	Remedy
	Faulty nozzle vacuum or blow.	1) On the Robot Control screen (see <i>Figure 40 – 8</i>) check the Vacuum checkbox. 2) The vacuum reservoir at the front lower section of the machine should be heard to be replenishing every few seconds. 3) Uncheck the Vacuum box and check the Blow box. 4) Open the front door and place a hand under the nozzle to verify if air is blowing out of the nozzle. (Do not touch the nozzle as this may leave finger grease deposits). The air pressure reservoir at the front lower section of the machine should also be heard to be replenishing every few seconds. 5) If both checks fail, the nozzle may be blocked. If only the vacuum test fails, then the vacuum system may be faulty.
	The hopper exit is blocked.	The stones exit the hopper through a hole between the receptacle and the chute. This can be blocked by stones. Clear if required. Blockages may also occur if the humidity is too high. See below.
	No water in humidifier bottle.	Stones may be sticking together because of low humidity. Fill bottle if required (see Monthly Veri Che the

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Symptom	Possible Cause	Remedy
		 Humidifier).
	Humidity level is too low	Verify that the internal humidifier is switched on. The humidity level control (<i>Figure 19 – 4</i>) also features an on/off switch. For normal operation the humidifier should be turned on and set to its lowest level. To verify this, turn the control fully anticlockwise until it stops and then turn clockwise until a click is heard. The minimum recommended relative humidity for normal operation is 50%. The internal relative humidity of the machine may be inspected during a run using Status View (See section 8.2.7). Allow several minutes after the start of the run for the internal control system to stabilise the humidity level inside the machine.
	Humidity level is too high	The maximum relative humidity for normal operation is 65%. The internal relative humidity of the machine may be inspected during a run using Status View (See section 8.2.7). Allow several minutes after the start of the run for the internal control system to stabilise the humidity level inside the machine. Ensure that humidity level control (<i>Figure 19 – 4</i>) is set to its lowest value. This also features an on/off switch. For normal operation the humidifier

3) From left to right
Reference s

4) From front to back
Reference s

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Symptom	Possible Cause	Remedy
		should be turned on and set to its lowest level. To verify this, turn the control fully anticlockwise until it stops and then turn clockwise until a click is heard. The internal humidity control will not be able to compensate if the relative humidity of the environment in which the machine is situated is above 65%. Consideration should be given to moving AMSMicro to a more suitable environment.
	Humidifier module is faulty	If the humidity level is consistently too low or high, the humidifier module is switched on and set to the correct level (see above) and there is water in the bottle, the humidifier module may be faulty. One symptom of this is that the water level in the bottle does not decrease over time. Call De Beers Technical Support (Section 14).
Robot Height Calibration Fails	One of the parts which is measured during this process is not fitted correctly.	Check that the nozzle, feeder tray and disc are correctly fitted.

10 MICROSOFT WINDOWS UPDATES

It is important that the Microsoft Windows operating system and the Windows Defender anti-virus software which are used by AMSMicro are kept up to date. For this reason, the user must ensure that the AMSMicro is always connected to the internet to allow relevant updates to be downloaded as soon as they become available.

By default, Windows updates will be downloaded automatically with the user then being prompted to approve their installation. Although the operator may deny approval for the update, after a certain period of time has elapsed the update will be applied automatically. For this reason, it is good practice to approve the installation of the update when first prompted.

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While updates are being installed, AMSMicro must not be used for screening. An update may require one or more reboots before it is complete.

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11 SPECIFICATION

The following sections of this operating manual constitute the specification of AMSMicro:

Section	Section Number	Page Number
Specifications of Use	1	5
Safety	4	6
Typical Performance	5.1	12
External Rear View and External Connections	5.4	14
Physical Specifications	11.1	79
Legislative Compliance Testing	13	81

Any subsections of the section numbers referenced above are included in the specification.

11.1 PHYSICAL SPECIFICATIONS

Environmental	
Operating Altitude	2000 meters maximum
Temperature Range (Operating)	Indoors* 15 °C to 28 °C
Temperature (Storage)	Indoors* 0 °C to 70 °C
Humidity	Indoors* 45% to 65% non-condensing
Pollution	Pollution Degree 2
Over Voltage Category	2
IP Rating	IPX0
Electrical	
Rated Voltage	220-240 VAC ± 10% 50/60 Hz single phase
Rated Current	2.5 Amp
Rated Power	600 Watt
Optical	
Laser Source	Class 4 440nm ± 5nm 600mW
UV Source	60W Filtered Broadband Source
Enclosure Classification	Class 1
Mechanical	
AMSMicro Weight	264 kg
Shipping Weight	357 kg
DIMENSIONS	
• Length	920 mm
• Width	800 mm
• Height	1700 mm

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* AMSMicro is unsuitable for use or storage in outdoor conditions or any environment which exposes it to wet or cold environments

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12 SPARE PARTS

The following spare parts are available for AMSMicro. Refer also to section 5.8 for details of supplied accessories. Contact De Beers Technical Support (section 14) for ordering information.

Part No.	Title	Notes
3708-0361	Nozzle Assy	
PNEROBU15050	Nozzle Filter	
3708-1000-0030	Disc	This is the standard screening disc
FANF119S	Fan Filter 119mm Square Fibre	Used on the square external fans
LABCH102923C	Water, Analar Normapur	Deionised/demineralised water may be sourced locally but must be a direct equivalent. Tap water must not be used.
3708-0860	Dispenser Pass Bin	
3708-0861	Dispenser Refer Bin	
3708-0862	Dispenser Lab Grown Bin	
3708-0863	Dispenser Non-Diamond Bin	
3708-0864	Dispenser Spare Bin	
3708-0865	Dispenser Purge Bin	

13 LEGISLATIVE COMPLIANCE TESTING

13.1 LEGISLATIVE COMPLIANCE DIRECTIVES

AMSMicro is compliant with the following directives:

Machinery Directive	(MD)	2023/1230/EU
Low Voltage Directive	(LVD)	2014/35/EU
Electromagnetic Compatibility Directive	(EMC)	2014/30/EU
Restriction of use of Certain Hazardous Substances in Electrical and Electronic Equipment Directive	(RoHS)	2011/65/EU
Waste of Electronic and Electrical Equipment Directive	(WEEE)	2012/19/EU

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13.2 STANDARDS TO WHICH CONFORMITY IS DECLARED

AMSMicro has been designed to the following harmonised standards:

EN 61326-1:2021	Electrical equipment for measurement, control and laboratory use - EMC requirements.
BS EN 61010-1:2010+A1:2019	Safety requirements for electrical equipment for measurement, control, and laboratory use
IEC 60825-1:2014	Safety of laser products. Equipment classification and requirements

13.3 CE DECLARATION OF CONFORMITY

A copy of this document is supplied with AMSMicro. See section 5.8.

14 CONTACT INFORMATION

For service:

techsupport@debeersgroup.com

Other Enquiries:

De Beers Ignite™

De Beers UK Limited.

Belmont Road, Maidenhead

SL6 6JW

UK

15 GLOSSARY OF TERMS

TERM	DESCRIPTION OR MEANING
Melee	As related to diamonds, refers to smaller diamonds which are handled in batches rather than individually. The largest stone size to which the term melee is applied varies somewhat but is generally considered to be around 0.2 carats. The greatest volumes of melee are found in sizes much smaller than this however.
HPHT	High Pressure/High Temperature (HPHT) is a popular technique for producing lab-grown diamonds. It is widely used in the creation of lab grown diamonds for industrial use.
CVD	Chemical Vapour Deposition (CVD) is becoming a more popular technique for producing gem-quality lab grown diamonds for jewellery.

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3708-4980 AMSMicro Operating Manual

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