ARC Precision

USER MANUAL

ARC ULTIMATE BRASS ANNEALER

Thank you for purchasing our instrument, designed, and built with passion.



Contents

1. Safety Instructions for Using the Annealer 3

2. General Information 4

3. Operating Voltages and Fuse 4

4. User interface 4

4.1. Touch Screen / Graphical User interface (GUI) 5

4.2. Buttons and switches 5

4.3. Top 5

4.4. Bed 5

5. Basic Principles 6

5.1. Height setting 6

5.2. Applying heat 6

5.3. Thickness gradient and Thermal Centre 7

5.4. Annealing Area 8

5.5. MHT Sensor 9

5.6. .308 / 7.62x51 Setting Example 9

6. Operation 12

6.1. Introduction Screen 12

6.2. Main Screen 12

6.3. MHT Setup / Adjustment 13

6.4. Height Setup / Adjustment 14

6.5. Memory Management. 15

6.6.1. Select Memory 16

6.6.2. Add Memory from Global 16

6.6.3. Add New Setting to Memory 16

6.6.4. Changing Names 16

6.7. Feeder Setup 17

6.8. Annealing 17

6.8.1. General 17

6.8.2. Anneal Sequence 18

6.8.3. Anneal Defaults 18

6.8.4. Normal Anneal 19

6.8.5. Pulse Annealing 19

6.8.6. Pulse Annealing explained 20

7. **Case Guides** 20
8. **Setting up your ARC Ultimate Annealer** 20
9. **Cooling and temperature control** 21
10. **Firmware / Hardware Updates** 21
11. **Specifications** 22

1. Safety Instructions for Using the Annealer

⚠ DANGER **LIVE VOLTAGES ARE PRESENT! DO NOT ATTEMPT TO OPEN THE ENCLOSURE.**

⚠ DANGER **NEVER ATTEMPT TO ANNEAL LOADED AMMUNITION OR PRIMED BRASS! ENSURE PRIMERS, POWDER, AND PROJECTILES ARE REMOVED FROM ANY BRASS.**

⚠ DANGER **DO NOT USE NEW WATER OR IN WET CONDITIONS**

⚠ DANGER **DO NOT OPERATE OR TOUCH THE INSTRUMENT WITH WET HANDS.**

⚠ DANGER **ENSURE LIVE PRIMERS ARE REMOVED FROM CASES BEFORE ANNEALING!**

⚠ WARNING **NEVER LEAVE THE INSTRUMENT TO RUN UNATTENDED. AUTOMATIC FEED AND ANNEAL FUNCTIONS ARE INDENDED TO OPTIMIZE DUTY CYCLE OF THE INSTRUMENT AND DO NOT MONITOR POTENTIAL SAFETY HAZARDS.**

⚠ WARNING **DO NOT BLOCK THE VENTILATION OPENING ON THE ENCLOSURE. THESE ARE REQUIRED TO PREVENT OVERHEATING OF THE INSTRUMENT.**

⚠ WARNING **KEEP MAGNETICALLY SENSITIVE ITEMS AWAY FROM THE ANNEALER**

⚠ WARNING **CONTINUOUSLY MONITOR THE CASE POSITION DURING OPERATION. STOP AND REMOVE THE CASE IMMEDIATELY IF POSITIONED INCORRECTLY. THE BED MAY BE DAMAGED IN THE CASE OF BAD POSITIONING.**

⚠ WARNING **ONLY USE A GROUNDED 3-PIN AC POWER CABLE FOR POWER SUPPLY TO THE INSTRUMENT**

⚠ CAUTION **CARTRIDGES ARE HOT! THE INSTRUMENT WILL HEAT THE CARTRIDGE NECK AND SHOULDER TO AT LEAST 500°C (930°F). CATCH CARTRIDGES IN A NON-FLAMMABLE PAN OR DISH.**

⚠ CAUTION **CARTRIDGES ARE HOT! DO NOT TOUCH ANNEALED CARTRIDGE CASES WITH BARE HANDS.**

⚠ CAUTION **BEFORE REPLACING ANY FUSES, IDENTIY & FIX ANY ISSUES. CONTACT ARC PRECISION OR ADG LLC FOR ASSISTANCE PRIOR TO REPLACING THE FUSE.**

⚠ CAUTION **KEEP THE ANNEALER AWAY FROM HEAT SOURCES. DO NOT OPERATE THE ANNEALER IN DIRECT SUNLIGHT.**

⚠CAUTION **DO NOT CONNECT MOBILE PHONES OR OTHER DEVICES TO THE USB CONNECTIONS. THE USB CONNECTIONS ARE NOT DESIGNED TO POWER MOBILE DEVICES OR COMMUNICATION WITH ANY DEVICES OTHER THAN ARC PRECISION OR ADG LLC APPROVED DEVICES.**

2. General Information

- ARC Precision YouTube Channel: https://www.youtube.com/channel/UCSdgn0gXjikkfEKTh3lqUuQ
- ARC Precision Facebook Link: https://web.facebook.com/ARCPrecison/
- Email: **info@arcprecision.co.za**
- Web: **arcprecision.co.za**

3. Operating Voltages and Fuse

The ARC Annealer has been tested to operate at both 110V AC and 220V AC. It comes with a default configuration of 110V AC. However, if necessary, you can easily reconfigure it by removing the top cover and switching between the two voltage options. The switch for this can be found at the back of the main power supply or along the side. Remember to specify the desired voltage if different from the default setting. The following is the amperage draw based on the power supply:

Supply Voltage	Idle Current	Anneal Current
239.0 V	0.27A	2.81A
110.1 V	0.22A	6.26A

The fuse installed for 110V is a 6 Amp slow blow, 15mm standard fuse. Change to 3.15 Amp slow blow when changed and operating at 220V AC.

4. User interface



4.1. Touch Screen / Graphical User interface (GUI)

The ARC Ultimate is equipped with a touch screen for controls and adjustments, offering users a variety of menus and pages for navigation, guided by a clear menu structure. The design features two microprocessors: one for the user interface and another for operation. These key components communicate through an RS232 interface. Significant effort has been put into embedding protective limitations within the firmware to safeguard the hardware.

To operate the touch screen, gently press the buttons; no excessive pressure is required. Regularly clean the screen using a soft cloth, avoiding the use of chemicals or water. It is acceptable to occasionally use alcohol for this purpose.

4.2. Buttons and switches

The ARC Ultimate features several buttons/switches to facilitate user interaction:

MAIN POWER SWITCH. The main On/Off switch is located at the back of the device. If you won't be using the instrument for an extended period, it is recommended to switch it off to completely isolate the power from all of the electronics.

POWER SWITCH. The ON/OFF power switch is located at the bottom right side of the front of the instrument. It is recommended that this switch be turned OFF when the unit is not actively being used.

STOP BUTTON. The 'STOP' button is located on the lower right edge of the touch screen display housing on the front of the instrument. The STOP Button serves two purposes:

1 – It will immediately stop/halt an anneal cycle if one is in-process
2 – It will open the drop door and drop any parts or items that are sitting on the drop door

4.3. Top

The Top of the ARC Ultimate houses several key components, including the core, winding, MHT array and load sensors.

The load sensors, positioned at the bottom of the Top, are responsible for detecting when a case is placed for annealing. Make sure that they are not obstructed by any objects, as they also initiate the annealing process in Auto Mode. For this reason, it is essential to disable Auto Mode when not actively annealing.

⚠CAUTION Disable AUTO Mode when not actively annealing cartridges.

Also ensure that the case guide used does not obstruct the light path when no cartridge case is installed. For that reason, a thin/short case guide is supplied in some instances of very short case heights.

4.4. Bed

The bed height of the ARC Ultimate is adjustable and utilize a stepper motor for height control. There is a carbon-fiber drop mechanism that also serves as the cartridge support. The bottom position of the bed serves as a 0-point reference for the height setting. At different times, the

instrument will lower the bed to the 0-point to ensure the correct height is achieved, according to the programmed settings.

The bed houses the drop mechanism, which is operated by a servo that opens and closes the carbon-fiber drop door. Ensure that the opening is not obstructed, as the servo is quite powerful! Do not place your finger in the opening at any time, this could result in your finger or the object being severed!

⚠ DANGER RISK OF SEVERED FINGERS! DO NOT PLACE YOUR FINGERS OR ANY OBJECT INTO THE CARTRIDGE SUPPORT MECHANISM.

5. Basic Principles

Many users anneal to extend case life, while others do so to achieve greater consistency in velocity and accuracy. For this reason, it is crucial for reloaders to follow a consistent process when reloading, avoiding numerous changes from one reloading session to another. The same principle applies to annealing. Define and maintain the same process, making adjustments only when necessary, and ensure that the expected outcomes align. We also suggest that primers be removed before annealing.

Below are some basic principles that can assist with the annealing process and the use of the ARC brass annealer:

5.1. Height setting

Height is controlled by Stepper motor and each step is approximately 0.04mm. The counts start at the bottom position.

5.2. Applying heat

Keep in mind that when heat or energy is applied to the neck, shoulder, or below the shoulder of the case, the remainder of the case, which are at ambient temperature, will absorb the heat. As a result, annealing time will vary depending on the starting temperature of the case. It takes less time to heat a case from 40°C to 400°C than from 10°C to 400°C. For this reason, pre-heating is required to produce the most repeatable results.

ARC Ultimate features a Pre-Heat cycle that increases the case temperature before annealing, greatly improving the consistency process. This feature is automatic and cannot be turned on or off by the user.

Based on open coil induction annealing research, it should be understood that physically annealing the neck is a secondary need for consistency as the first 1 or 2mm below the neck is of more importance. The heat will soak into the neck of the cartridge case to get a consistent anneal.

The neck provides coaxial stiffness and some resistance to the release of the projectile. The consistency of the material properties of the neck, controlled in conjunction with a consistent neck tension (the diametrically difference between the projectile and the case mouth) will yield move consistent projectile release forces when firing. This will then result in more consistent muzzle velocities, assuming all other requirements are met. Although efforts are made to ensure a homogeneous alloy in the brass case, variances can still occur. Sometimes these non-homogeneous anomalies can become visible as dark or black spots in the annealed

region if a case is significantly over-annealed. These variances contribute to inconsistent annealing results, as they can vary from case to case and are brand-dependent.

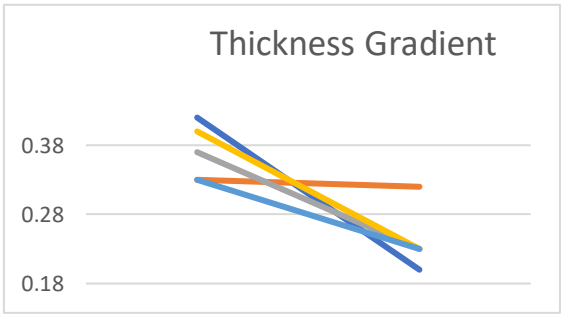
Many users rely on discoloration as an indicator of proper annealing, which can be a considerable mistake. After thousands of annealing sessions, it has been noted that some brands (even expensive ones) do not give consistent discoloration. The level and consistency of the discoloration is more directly related to the cleanliness of the cartridge case than anything else when subjected to the same annealing profile. However, inconsistent discoloration is not necessarily a bad thing. It's merely an observation and a cautionary note if you rely on this method. Discoloration is only an indicator that annealing has occurred in the cartridge case. If the MHT levels were the same for all cases, the hardness will also be the same for all cases, within the same brand or lot of cartridge cases.

If performing the annealing in a dark room with no feeder attached, the heating glow of the cartridge cases can be observed. This method allows a good visual of the heat distribution and flow through the cartridge case. Based on internal research, it is suggested that annealing is performed from the base of the neck to approximately 1-2 mm below the neck. This will apply the heat in such a way that the heat will spread into the neck while the temperature below the shoulder is monitored. Also see the section “Thickness Gradient and Thermal Centre” section of this manual for more information.

5.3. Thickness gradient and Thermal Centre

Cases can vary significantly in construction and design, particularly when comparing older to more modern calibers. Older calibers tend to have a gradually decreasing case wall thickness, starting from the head and becoming thinner towards the mouth. In contrast, more modern calibres like the 6mmBR have a thickness gradient that reduces more rapidly than traditional cases. The thickness gradient measures the thickness before the shoulder and at the mouth, which are the regions applicable for annealing. The shoulder region in modern cases can differ in length significantly from that of older, traditional cases.

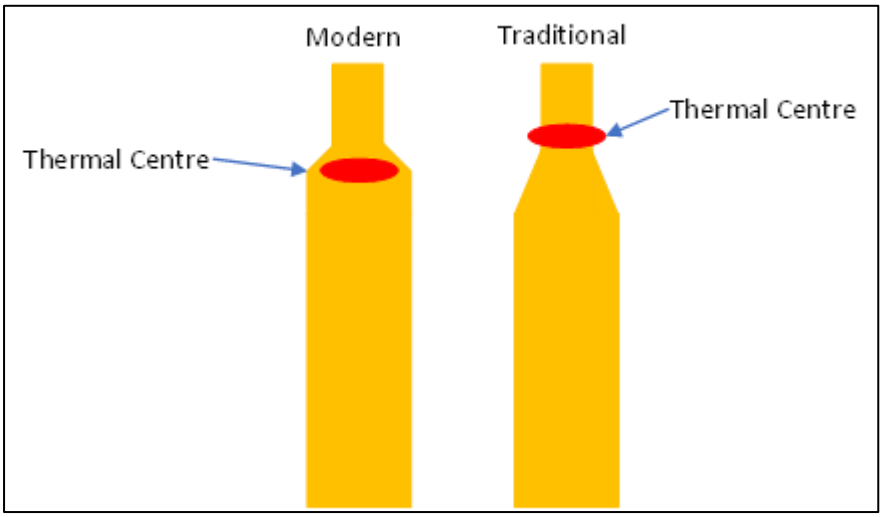
The following is the thickness gradient of several cartridge designs as measured at the base and at the mouth:





The very steep gradient is that of 6mm BR, the same is applicable to the WSM.

Given the differences in case construction, heat flow or distribution will vary when heat is applied at the neck, depending on the case style. For traditional cases, applying heat in the neck area is adequate, but for those with a steep thickness gradient, it is necessary to position the case higher to achieve an even distribution between the neck and shoulder. In such cases, the Thermal Centre is located much lower, allowing the heat to flow more effectively from the shoulder to the neck, rather than from the neck to the shoulder.



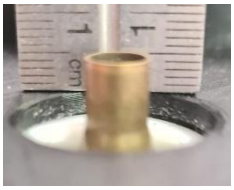
5.4. Annealing Area

The following test was conducted to visually demonstrate the stretch that is annealed and provide explanatory images for users. In this test, the Time Based setting was set to 9 seconds, and heat was applied to the case body by setting the bed at an unusual high position, enabling the achievement of these results for demonstration.

The accompanying images show the case before annealing. For this test, the case was loaded at an abnormally high position, with the neck protruding approximately 6 mm, to allow for annealing the case body for visual demonstration. In the final image, after a 9-second anneal, the annealed stretch is visible, showing a reach of 40mm or 20mm below the centre and 20mm above.









These test results help users understand what to expect while determining the appropriate bed height and the width of the heat application area from induction when the case is positioned in the bed.

It is important to note how the heat has spread to the neck area during this test, due to the extended annealing time. This visualization gives users valuable insight into how the annealing process works and how adjustments in height and time can impact the heat distribution across the case.

5.5. MHT Sensor

The ARC Annealer is equipped with a light sensitive IR measurement array. For best results, it is important to ensure that the lighting conditions around the annealer are consistent. Care has been taken to shield the piece from ambient light by the design of the feed funnel, but the most consistent results are obtained when the lighting conditions are the same each time the product is used. Attachment of the feed funnel or cartridge feeder aid in isolating the MHT from ambient light sources, providing improved consistent results.

The protected MHT algorithm works on a Logarithmic scale, at the bottom of the range, setting of 315, is an estimation of the case temperature in Celsius. A non-linear algorithm goes up to 927, the melting point of cartridge brass. Visit the ARC Precision YouTube channel and see our Method Validation video for more information.

The user can define the MHT setting that will control the power to the induction unit as well as which of the five sensors to monitor for that control. Each time an anneal is performed, the data for all five sensors will be displayed, indicating the range of heat levels over the entire monitored region.

5.6. .308 / 7.62x51 Setting Example

The following is an example of settings and the variation that can be accomplished using SAKO .308 brass cases.

5.6.1. Test 1 (Baseline) – Height 808, MHT 350 / 3

The MHT setting at 350 and sensor 3, the height setting at 808. This is a baseline setting to compare the adjustments to.



5.6.2. Test 2 – Height 808, MHT 350 / 4

The MHT setting at 350 and sensor 4, the height at 808. In this case the heat reached further down the case, as sensor 4 is lower than sensor 3.



5.6.3. Test 3 – Height 808, MHT 350 / 5

The MHT setting at 350 and sensor 5, the height at 808. In this case the heat reached further down the case the case, as sensor 5 is lower than sensor 4.



5.6.4. Test 4 – NORMAL vs. PULSE MODE, Height 808, MHT 350 / 3

This example has the same settings as in Test 1 (Baseline) with the difference being the type of annealing process. In PULSE mode, the power to the annealer is cycled on and off for a short period of time until the monitored temperature is reached. This method drives the heat deeper into the cartridge case, as is evident by the location of the annealing lines in the samples.



5.6.5. Test 5 – Height 808, Varying MHT Levels at Sensor 3

For this illustration, the height was maintained, but the MHT level was varied at values of 350, 360, 390, 420, 470, and 550, all observed through sensor 3. As is observable in the image, the heat drives deeper down the case. What is non-observable in the image is that the neck temperature got upwards of 800 in the 550 case (sensor 1 position). This likely indicates an over-annealed condition in which the case neck and should are too soft to can possibly be crushed during loading.

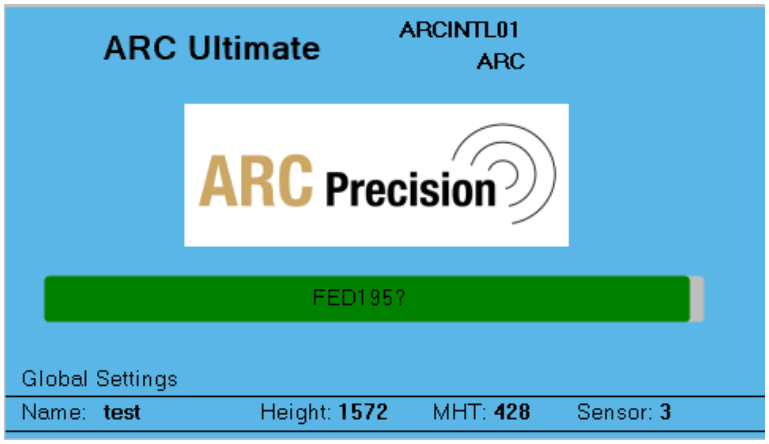


6. Operation

The following is a summary of the basic operation of the instrument. While there will be upgrades and changes to the operating system as the system is improved over time, the basic principles stay the same. Your specific model screen layout by be slightly different than what is depicted.

6.1. Introduction Screen

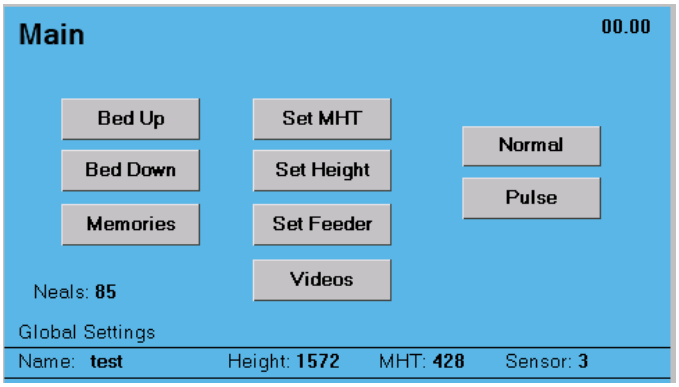
This screen is displayed when switched on.



All internal communication is tested during startup and the progress shown with the green progress bar. The firmware version is displayed at the top center of the display and the instrument serial number is displayed at the top righthand side of the display. The current global settings are shown along the bottom line on all screens of the machine during operation. The Global Setting show the loaded program name, the height setting, the MHT setting / Sensor setting, and the time setting currently loaded into the instruments instruction set.

When the internal communication test is completed, the drop servo door will open and close and the system will advance to the main screen automatically.

6.2. Main Screen



All the available operational functions are displayed on this screen along with some additional key information, including:

- Total number of anneals completed to date is displayed at “Neals” under the Memories button.
- Current internal temperature of the induction power unit is displayed at the top right of the screen

- The current global settings or selection is displayed along the bottom edge of the screen.
  - It is important to keep an eye on the Global Settings as these are the settings used during operations. Any changes in any other menu will update and change the global settings at the bottom of the screen.
  - The MHT setting and selected MHT Sensor is displayed. Ie 355 and sensor 4 means the MHT is set at 355 and sensor 4 is controlling the ON/OFF function of the unit when annealing.

BED UP: Will move the bed down to the 0-position and then up to the indicated height as per value displayed as global setting. This setting can be adjusted in the Set Height section.

BED DOWN: Will move the bed to the bottom 0-position. This setting is intended to be used for guide-feet replacement with easy access to the bed and for the height estimation function.

MEMORIES: This button will access the up to 1000 memories for cartridge case annealing settings. Theses settings can be created by the user and the instrument will come pre-loaded with ADG recommended setting for ADG Cartridge Cases.

SET MHT: Access to the MHT setup screen and functions. Changes applied to this screen will be updated to the Global Settings at the bottom of the screen.

SET HEIGHT: Access to the Height adjustment screen and functions. Changes applied to this screen will be updated to the Global Settings at the bottom of the screen.

SET FEEDER: Access to the Feeder Setup Screen. This will access the feeder pickup and drop locations when attached to the annealer.

VIDEOS: Access to tutorial and instructional videos. A series of instructional videos are provided on the instrument to provide the user with access to video instruction regardless of internet connectivity.

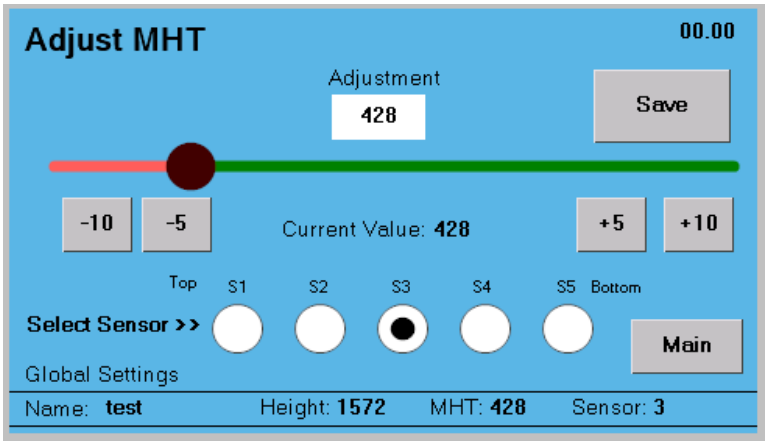
NORMAL: Normal Annealing Mode function. When this button is selected, the drop door will open and close and the bed height will go to the 0-position and then to the height in the Global Settings. The screen will change to the Normal annealing mode screen.

PULSE: Pulse Annealing Mode function. When this button is selected, the drop door will open and close and the bed height will go to the 0-position and then to the height in the Global Settings. The screen will change to the Pulse annealing mode screen.

6.3. MHT Setup / Adjustment

- The MHT sensor limits are limited in the software for protection of the instrument and safety of the environment that the instrument is located within.
- The minimum value is 315 and maximum value is 927. These numbers are roughly related to the glowing and melting temperature of Brass in degrees Celsius. No annealing can actually occur below 315C in cartridge brass.

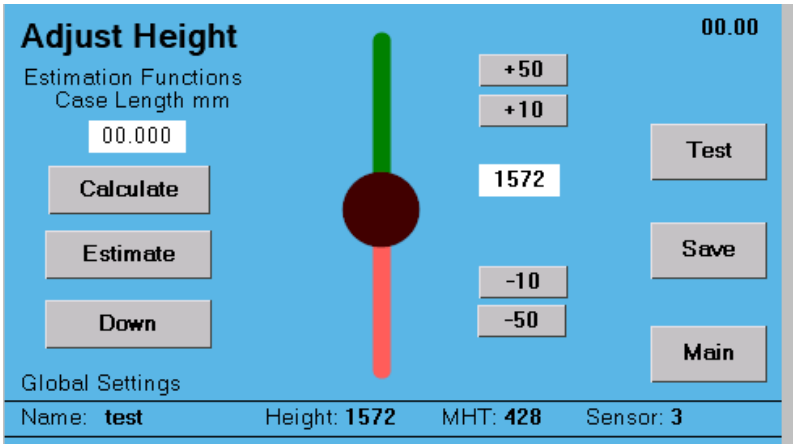
- At the bottom end (315) the MHT settings will be close to the actual case heat in Celsius. If easier to remember, users may see it as a setting in degrees Celsius.
- When in doubt, start with a MHT Setting of 350 at S3.
- Ensure the case is heigh enough for the sensor to 'see' the case. Ie, sensor 1 would not function on the high end should the case mouth be below the visual line of sensor 1, etc.
- A higher MHT number means a higher stop/control temperature.
- Select the sensor of choice. S1 is at the top of the instrumented range (highest point on the case) and S5 is at the bottom of the instrumented range (lowest point on the case).



- The Current setting of the MHT and monitored sensor is displayed as Global Variable at the bottom of the screen; 428 and sensor 3 in the illustration shown.
- The new setting is displayed in the center of the screen and will change as the user makes adjustments by moving the black dot on the slider with the finger, left or right.
- Use + or – buttons for increments of 1 or 10 either up or down.
- Select the SAVE button to store and use the new values to the Global Settings. The new settings will be displayed on the Global values along the bottom of the screen.
- Select the MAIN button to return to the main screen.

6.4. Height Setup / Adjustment

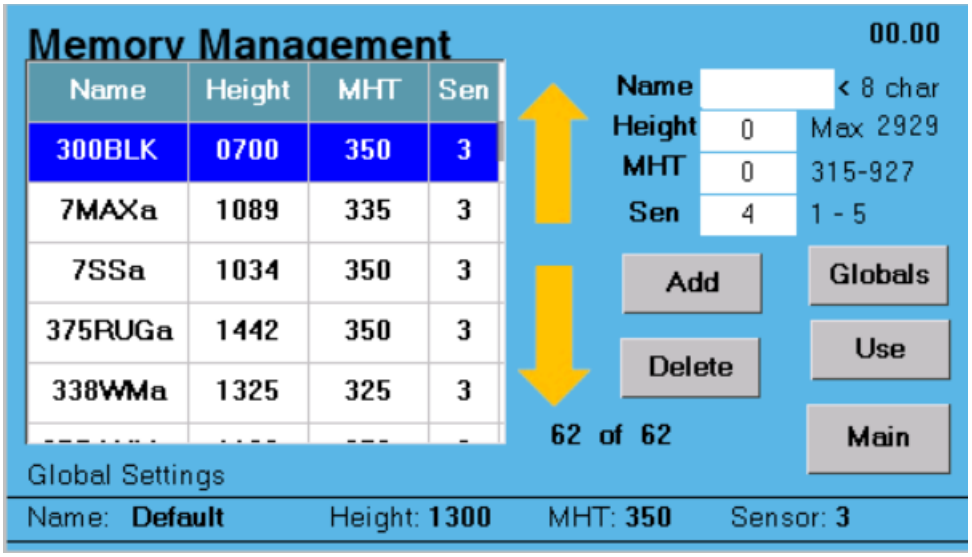
- The height is calculated from the bottom position in number of counts, electronically adjusted by means of a stepper motor.
- Each count or step is approximately 0.04mm
- The Maximum height is programmed during production as top end point.
- A higher number indicated a higher position.



- The Current setting is displayed at the bottom as part of the Global Settings.
- The new setting displayed in the middle. This value will change as the user makes adjustments.
- Adjust with the slider up or down with the finger.
- Use + or – for increments of 10 either side. The same for + and – 50.
- Use **Test**, to test the setting, check for mechanical binding. Test will not store or activate the setting.
- Use Save to store and use the new setting. When Save is pressed, the current setting will be transferred to the bottom line as part of the Global settings.
- The setting is transferred across all screens and functions as current height setting.
- CALCULATE:
  - Measure the case length from the bottom of the case to the point that you with to have centered in the induction core.
  - Press “CALCULATE” to update the value
  - Press Test to verify the position with a sample case
  - Press SAVE to save the result to the Global Settings
- Pressing “Down” to move the ned down:
  - When down, place a case on the bed.
  - Press “Estimate” after which the instrument will find an estimated hight automatically.
  - Press Save when done to share the value as a Global Variable visible at the bottom of the screen.
- Use “Main” to go back to the Main screen.

6.5. Memory Management.

- The number of memories available is limited to 1000.
- Memory names are limited to 8 characters only.
- Pressing on the Complete settings list and move up and down will move the complete list up and down.
- The number of settings stored are displayed at the bottom right of the complete listing.

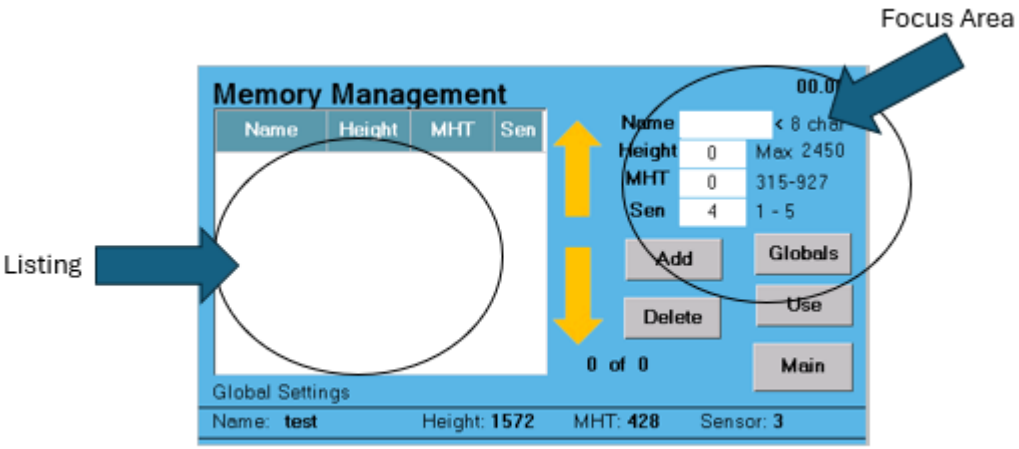


6.6.1. Select Memory

- Press on the memory in the complete listing area.
- The values will be transferred to the Focus Area.
- Press “Use” to transfer to the Global Settings at the bottom of the screen.

6.6.2. Add Memory from Global

- This function is to transfer the current Global Setting to the Focus fields.
- Press on “Globals” and the global setting will be displayed in the focus area.
- Press on the White Name field to see the Keyboard.
- Enter the name of the setting.
- Press Add to add the new setting on the complete listing.



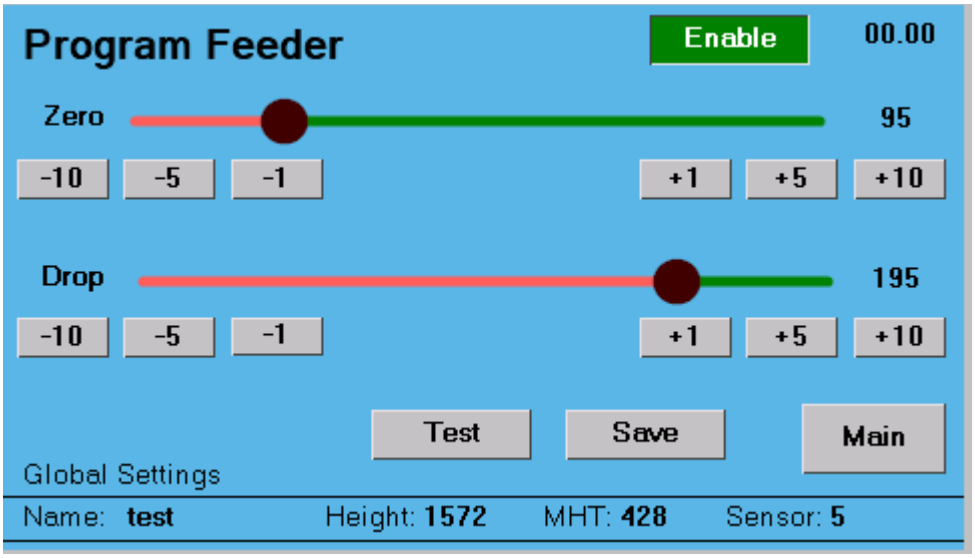
6.6.3. Add New Setting to Memory

- Press on the Name, Height, MHT or Time field to bring up the keyboard for entering text and values.
- Press on add to add the new setting to the Complete listing.

6.6.4. Changing Names

- Load from the Listing screen.
- Press on the Name field in the docus area and enter the new name.
- Add the setting to the listing.

6.7. Feeder Setup



- Enable the feeder or disable the feeder
- Using the sliders, adjust the Zero Position and drop position.
- Both Drop and Zero Position can be adjusted in smaller steps ie +5, -5, etc.
- Zero position is the collect position and drop should line the opening up to the Thunell below.
- Test will test one complete cycle, including the vibrator and drop afterwards.
- The sliders are active, when released after adjustment, the grabber will move accordingly.
- Two grabbers are supplied, 10,12, 14 and 16mm to suite various brass cases.
- If the Feeder is enabled and Auto Mode is selected in any of the Annealing screens, the anneal process will start automatically, feeding and annealing.
- In the case of a “miss feed”, the annealer will stop after 3 attempts and disable the selection.
- If the Feeder button will only be visible in the anneal screens if enabled on the Feeder Setup screen.

6.8. Annealing

6.8.1. General

There are 2 options on the Main Menu, Normal and Pulse Anneal.
The operational logic is the same for both with similar or the same GUI layout.
Accessing any 1 of these functions or screens will produce the same preparation procedure.

- Firstly, the door will be opened to drop any possible case that might be on the bed.
- Secondly the bed will be lowered to the bottom position and then move back to the height as per global setting.

In all options, there are two modes of operation available:

- **Manual:** This means the user must press the Anneal button to anneal a case.

- **Auto:** this means the system will automatically start annealing if a case is sensed/detected. For this reason, it is important to ensure that the bed is clear when not in use and that there are no other obstructions that can lead to a "false anneal".

****

⚠WARNING

There are two optical sensors placed on the inside bottom of the Top which is used to sense "loaded" or "not loaded/empty" Should this path be obstructed by perhaps a case guide not placed well or any other obstruction, the ARC annealer might switch on the power circuit automatically which will cause damage to your annealer. Please always keep an eye on the anneal process and ensure that the "sensor path" is clear when not annealing.

⚠WARNING

***** Ensure the correct case guide is used as the cartridge will not centre if wrong case guide is used and might cause serious damage if loaded in off-centre or skew position. As no Case holder is in use, the case might move slightly during annealing. Please check the case guide holder position as movement is possible in transit. *****

****** If using a custom Case Guide, ensure the load sensors are not obstructed ******

⚠WARNING

****

Throughout the annealing processes, irrespective of mode, a 50% duty cycle is maintained. This is to slow heat build-up and will prevent further annealing until the system is ready. The delay is equal to the time taken for the previous anneal, including the pre-heating time. The buttons are disabled until the system is ready again.

6.8.2. Anneal Sequence

In all annealing Modes, the case is first pre-heated before annealing.

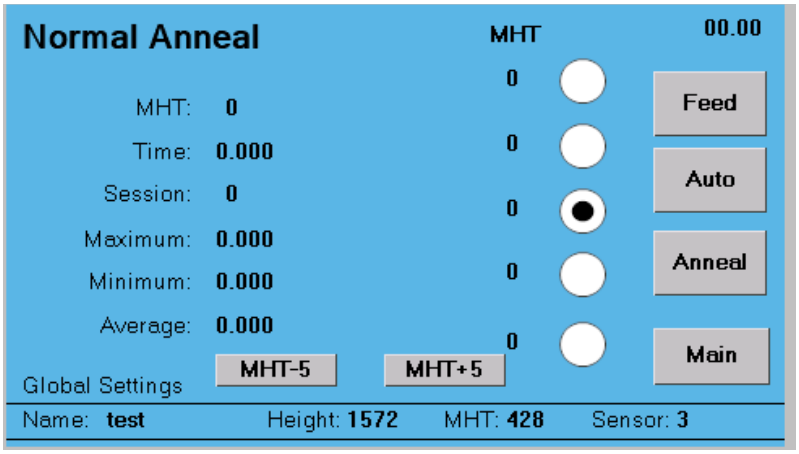
- Hence the Time measured exclude the pre-heat time.
- The displayed time during Normal and pulse annealing also excludes the pre-heat time.

6.8.3. Anneal Defaults

- The session counter will increase automatically after each successful anneal.
- The session counter starts at 0 when the user reaches the Anneal screens.
- The Neals and session counter will not increase if Stop was pressed at any time during an anneal.
- The statistical average Anneal Time or MHT also starts at 0 each time the user reaches the Anneal screens.

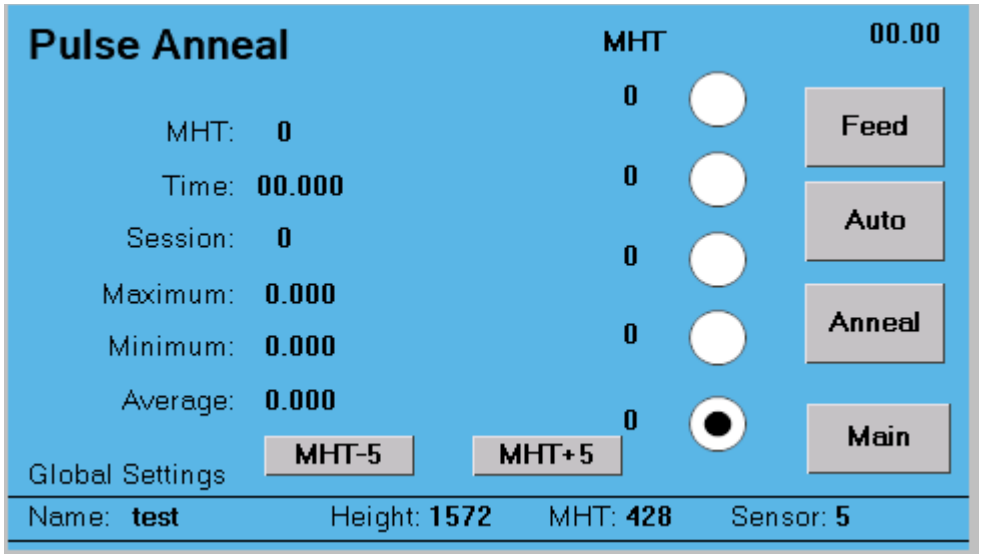
6.8.4. Normal Anneal

The anneal cycle in this case is Pre-Heat and anneal to the desired MHT Level setting.



- Auto will place the ARC Ultimate in Auto Feed mode. The anneal process will start once the Load sensor in the bottom of the Top detects a case(obstruction). Other buttons are disabled when Auto is enabled.
- Anneal will start a normal anneal cycle.
- MHT+5 or MHT-5 will increase/decrease the Selected Sensor MHT level by 5. This is useful for minor adjustments. Remember to update the related memory settings if applicable afterwards.
- The result Time and MHT levels of the various sensors are updated after each anneal and zeroed at the start of the next.
- Session will increment automatically since the Anneal screen is reached. Leaving the Anneal screen will zero the session counter.
- The Avg time is updated after each anneal with respect to the current session.
- The Temperature of the power circuit is updated and will automatically action a “high Temperature” screen and procedure when the temperature exceeds 65 degrees Celsius.

6.8.5. Pulse Annealing



6.8.6. Pulse Annealing explained

We found Pulse Annealing to be valuable when annealing modern cases with a lower Thermal Centre and steep Thickness gradient.

After pre-heating, 3 heating cycles occur, each to a different MHT Level with time delays in between. This method ensures that the applied heat is spread more evenly from the lower Thermal Centre to the neck/top.

This does however takes longer than Normal Anneal.

Also see "Setting Examples" above.

7. Case Guides

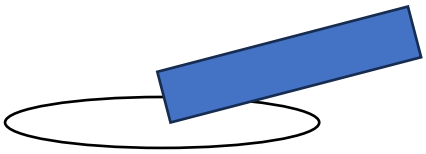
ARC annealers do not use a case holder. The case stands on the drop door and the selected case guide should allow free fall after annealing. This method is easier but works faster for reloading a case.

- Different case guides are used for different calibres.
- A set of 6 feet is supplied all made from Teflon.
- The hole size is cartridge bottom size + 1mm and tapered top to bottom to guide the cartridge to centre position. The 1mm allows free movement as the case is not clamped and held.
- The Magnetic flux will centre the cartridge within limits as per foot inserted.
- Ensure the correct "high case guide" or "flat case guide" is used, not to trigger the Load sensor with no case loaded.
- In some instances, the case might move off-centre, that will not affect the anneal process. The inner guide is from PTFE and well protected against heat. The time spent by the case at heat within the bed is minimal and should not damage surrounding components and was well tested thousands of times.
- ***Some adjustment of the bed top might be required in some case due to movement during transport.***

8. Setting up your ARC Ultimate Annealer

- In order to fully understand your instrument, we suggest that the user sacrifice old cartridge(s) when getting to use the ARC Annealer. It does make sense to 'play' with low risk cases, making sure you fully understand your annealer.
- Ensure the correct case guide is selected and installed.
  - Lower the bed, remove, and install correct case guide.
  - Press Stop to discard/drop the case. Ensure it falls freely when dropped, no mechanical binding between the case and the foot.
  - If stuck, the heat will reach the remainder of the case and cause melting.
- Adjust the MHT Level to 350 and select MHT Sensor 4.
- Navigate to the Set Height screen.
  - Gently load a case, it should fall to a default centre position.

- Hold the case such that the end is above the opening and release, the weight of the case will let it fall into position. No need to throw or force it in.



- Moving the slider left and right will produce different height values.
- Use the Test function and observe the result from the new setting.
- Using the "Estimate" function will he a great help as a starting point. Remember to save the value.
- This is only getting the user to understand his ARC Annealer, no need to be critical on the height setting now.
- Once comfortable navigate to the Anneal screen.

- Getting to the anneal screen, observe the sequence. The drop door will open, and the bed will move down and up to the programmed height.
- If possible, switch of lighting, it will make it easier for the user to see the glow/heat.
- Load the cartridge and press Anneal.
- In some instances, the case might move or "dance", this is acceptable and will still produce a valid anneal. Primers can also result in movement when sticking out below the head.
- Adjust the height, MHT levels and sensors and observe the changes in results.
- Even though dis-colouring can be misleading, it is useful to see the difference as you change settings, higher, lower or different MHT levels.
- You are ready to produce top class annealed cases!

9. Cooling and temperature control

- **ARC Annealer is air cooled.**
- Ensure the vents are not blocked during operation.
- Use Auto mode where possible to ensure 50% duty cycle is maintained.
- The resonator will stabilize at around 45 ^{o}C, dependant of environmental conditions.
- Above 55^{o}C the temperate displayed will change to Red as early warning,
- Above 65^{o}C, a "High Temperature" screen and routine is activated. The ARC annealer will prevent further annealing until the temperature reaches 50^{o}C whereafter the Main Menu will be displayed again.
- The Process is also visible with a double door open when activated and again when ready and on the Main Menu again.
- Please pace accordingly to ensure longevity of your ARC Annealer.

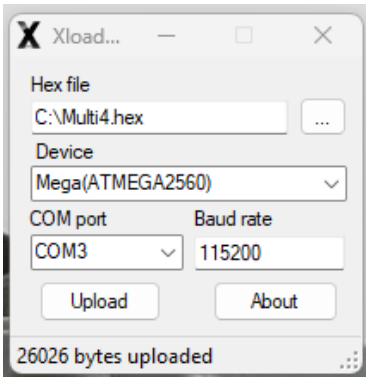
10. Firmware / Hardware Updates

Firmware Updates

These updates are upgrades and updates to the firmware and software of the instrument. These updates may include programming updates and device control updates necessary to keep the instrument capability and control optimized from time-to-time. Contact the supplier if in doubt.

- Download and install Xloader.exe onto your PC

- Switch ON the REAR switch of the instrument
- Switch OFF the FRONT switch of the instrument
- Plug the PC into the Computer Control USB-C port on the rear of the instrument using a USB-C to USB-A cable.
- Run Xloader.exe file
- Switch ON the FRONT switch of the instrument
- Select the desired HEX file from the three dot
- Select the ATMEGA2560 device (the base chip)
- Select the available COM port
- Leave the Baud rate as is
- Click “UPLOAD” – An “Uploaded” message will appear
- Disconnect the PC
- Recycle the FRONT switch power of the instrument.



Programming / TFT (Thin Film Transistor) Display Updates

These updates are upgrades to the on-board hardware system of the annealer unit. This update will upload data to the electronics on the PC controller board and should only be performed under the supervision or direction of ARC or ADG personnel.

- Switch the front switch to the OFF position
- Remove the SD card in the TFT Display Housing
  - Use tweezers and do not drop the card into the enclosure!
- Copy the xxxxx.TFT file onto the MicroSD card.
- Re-install the MicroSD card into the TFT Display Housing.
- Switch the instrument ON & wait for the update to complete per the screen text (it will be upside down).
- Switch the front switch to the OFF position
- Remove the MicroSD card in the TFT Display Housing
- Delete the xxxxx.TFT file from the MicroSD card
  - Do NOT delete any other files on the card!
- Re-install the MicroSD card into the TFT Display Housing
- Switch the instrument ON and operate as normal

11. Specifications

Size Boxed: 38 x 52 x 38 cm, 11kg
Enclosure: Steel, powder coated, Black
Power: Switchable – 120V, 7A, 60Hz OR 220V, 3.5A, 50Hz
Cartridge: max 100m long and 18mm wide at base. Contact us for your customer product should your requirements fall outside of these specifications.
Duty Cycle: 50% maintained during Auto Mode
Temperature: Shut Down above 60 ^{o}C
Speed: Typical 8 cartridges per minute of .223 This varies with respect to calibre and cartridge make (Brand)
Environmental: Do not use when the environment temperature exceeds 40^{o}C.