



USER MANUAL


Multi-zone ART Workstation

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Rx only



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Caution: Federal law restricts this device to sale by or on a licensed healthcare practitioner's order.

Only to be used by a trained and qualified professional. The device is sold under exemption 21 CFR 801 Subpart D.

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Our routine method of shipment is via common carrier. If physical damage is found, upon delivery, retain all packing materials in their original condition and immediately contact the carrier to file a claim.

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Please note only serialized products (products labeled with a distinct serial number) and accessories are eligible for a partial refund and/or credit. Non-serialized parts and accessory items (cables, carrying cases, auxiliary modules, etc.) do not qualify for return or refund. To receive a partial refund/credit, the product must not have been damaged. It must be returned complete (meaning all manuals, cables, accessories, etc.) within 30 days of original purchase, in “as new” and resalable condition. The *Return Procedure* must be followed.

Return Procedure

Every product returned for refund/credit must be accompanied by a Return Material Authorization (RMA) number obtained from Esco Medical Customer Service. All items being returned must be sent *prepaid* (freight, duty, brokerage and taxes) to our factory location.

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This instrument has been thoroughly tested/inspected and found to meet Esco Medical’s manufacturing specifications when shipped from the factory. Calibration measurements and testing are traceable and done according to Esco Medicals ISO certification.

Warranty and Product Support

Esco Medical warrants this instrument to be free from defects in materials and workmanship under regular use and service for two (2) years from the original purchase date. The provided instrument is calibrated and maintained following this manual. During the warranty period, Esco Medical will, at our option, either repair or replace a product that proves to be defective at no charge, provided you return the product (shipping, duty, brokerage and taxes prepaid) to Esco Medical. Any transportation charges incurred are the

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IN NO EVENT SHALL ESCO MEDICAL LTD. BE LIABLE FOR CONSEQUENTIAL DAMAGES. No warranty shall apply when any of the following causes damage:

- Power failure, surges, or spikes
- Damage in transit or when moving the instrument
- An improper power supply such as low voltage, incorrect voltage, defective wiring or inadequate fuses
- Accident, alteration, abuse or misuse of the instrument
- Fire, water damage, theft, war, riot, hostility, acts of God such as hurricanes, floods, etc.

Only serialized products (those items bearing a distinct serial number tag) and their accessory items are covered under this warranty.

PHYSICAL DAMAGE CAUSED BY MISUSE OR PHYSICAL ABUSE IS NOT COVERED UNDER THE WARRANTY. Items such as cables and non-serialized modules are not covered under this warranty.

This warranty gives you specific legal rights and you may have other rights, which vary from province to province, state to state, or country to country. This warranty is limited to repairing the instrument per Esco Medical's specifications.

When you return an instrument to Esco Medical for service, repair or calibration, we recommend shipment using the original shipping foam and container. If the original packing materials are not available, we recommend the following guide for repackaging:

- Use a double-walled carton of sufficient strength for the weight being shipped
- Use heavy paper or cardboard to protect all instrument surfaces. Use non-abrasive material around all projecting parts
- Use at least four inches of tightly packed, industrial-approved, shock-absorbent material all around the instrument

Esco Medical will not be responsible for lost shipments or instruments received in damaged condition due to improper packaging or handling. All warranty claim shipments must be made on a prepaid basis (freight, duty, brokerage, and taxes). No returns will be accepted without a Return Materials Authorization ("RMA") number. Please contact Esco Medical to obtain an RMA number and receive help with shipping/customs documentation.

Re-calibration of instruments, which have a recommended annual calibration frequency, is not covered under warranty.

Warranty Disclaimer

If your instrument is serviced and/or calibrated by someone other than Esco Medical Ltd. and their representatives, please be advised that the original warranty covering your product becomes void when the tamper-resistant Quality Seal is removed or broken without proper factory authorization.

In all cases, breaking the tamper-resistant Quality Seal should be avoided at all cost, as this seal is key to your original instrument warranty. In an event where the seal must be broken to gain internal access to the instrument, you must first contact Esco Medical Ltd.

You will be required to provide us with the serial number for your instrument, as well as a valid reason for breaking the Quality Seal. You should break this seal only after you have received factory authorization. Do not break the Quality Seal before you have contacted us! Following these steps will help ensure that you will retain the original warranty on your instrument without interruption.

WARNING

Unauthorized user modifications or applications beyond the published specifications may result in an electrical shock hazard or improper operation. Esco Medical will not be responsible for any injury sustained due to unauthorized equipment modifications.

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THIS PRODUCT CONTAINS NO USER-SERVICEABLE COMPONENTS.

UNAUTHORIZED REMOVAL OF THE INSTRUMENT COVER SHALL VOID THIS AND ALL OTHER EXPRESSED OR IMPLIED WARRANTIES.

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1 How to use this manual

The manual is designed to be read by sections and not ideally from cover to cover. It means that if the manual is read from start to finish, there will be some repetition and overlap. We recommend the following method for going through the manual: first, familiarize yourself with the safety instructions; then, proceed to the essential user functions needed for operating the equipment on a day-to-day basis; then, review the alarm functions. The menu functions of the user interface detail information that is required only for advanced users. All parts must be read before the device is taken into use.

2 Safety warning

- Anyone working with, on or around this equipment should read this manual. Failure to read, understand and follow the instructions given in this documentation may result in damage to the unit, injury to operating personnel, and/or poor equipment performance
- Any internal adjustment, modification or maintenance to this equipment must be undertaken by qualified service personnel
- If the equipment must be relocated, make sure it is appropriately fixed on a support stand or base, and move on a flat surface. When necessary, move the equipment and the support stand/base separately
- The use of any hazardous materials in this equipment must be monitored by an industrial hygienist, safety officer or other suitably qualified individuals.
Before you proceed, you should thoroughly understand the installation procedures and take note of the environmental/electrical requirements
- In this manual, important safety-related points will be marked with the following symbols:



NOTE

It is used to direct attention to a specific item.



WARNING

Use caution.

- If the equipment is used in a manner not specified by this manual, the protection provided by this equipment may be impaired.

3 Indication for use

The MAW, Multi-zone ART Workstation is a laminar flow workstation intended to work with gametes and/or embryos at or near body temperature during in vitro fertilization (IVF)/assisted reproduction technology (ART) procedures. The workstation also provides humidified gas to maintain gametes and embryos in the working environment.

4 About the product

The MAW, Multi-zone ART Workstation is a laminar flow workstation intended to work with gametes and/or embryos at or near body temperature during *in vitro* fertilization (IVF)/assisted reproduction technology (ART) procedures. The workstation also provides humidified gas to maintain gametes and embryos in the working environment.

The 12-zone heating system (8 x table plate and 4 x compartments) gives ideal temperature conditions compared to conventional layouts.

For maximum performance, the system has 12 separate temperature controllers, controlling and regulating each zone's temperature.

The workstation has been primarily developed and designed to incubate tissue, gametes and embryos with an overlay of either Paraffin or mineral oil.

If open culture is used, the user can utilize the humidified gas system built into the tabletop. The dish is placed under the gas hood where the pH conditions in a buffered media without oil overlay can be maintained.

 **Open culture may lead to evaporation and a change in pH if the correct conditions are not maintained.**

An integral part of the MAW, Multi-zone ART Workstation is the All-in-one PC, which runs with the Workstation logger software. The software functions as a constant surveillance system that will give the user early warnings if any parameter drifts beyond safe limits. The monitor can be used for a microscope camera image, as any warning will still be brought to the user's attention and an easy possibility to toggle the modes presented. The software includes data logging, data storage and report functions for ISO quality management compliance.

The device is manufactured under a full EU certified ISO quality management system.

This product fulfills EN60601-1 3rd edition standards as a Class I type B equivalent device suited for continuous operation. It also conforms to the EU Council directive's 93/42/EEC requirements concerning medical devices and is classified as a Class I device under rule XII.

Personal Protective Equipment (89/686/EEC) and Machine Directive (2006/42/EC) is not applicable for MAW, Multi-zone ART Workstation.

5 Transport, Storage and Disposal

5.1 Transport

The devices are packed in a carton box, and it is wrapped to a polyethylene. The box is affixed to a pallet with special straps.

A visual inspection should be done if there is any damage. If there was no damage found, the Multi-Zone ART Workstation is prepared to be transported.

These labels should be glued on the box:

- Label with the marked packing date
- Label with the product name and serial number
- Label with the country of origin
- Warning labels “Fragile” and “Handle with care”

5.2 Storage

The device may only be used under the following conditions:

- The unit can be in store for one year
- If stored longer than one year, the unit must be returned to the manufacturer for a new release test
- Store between -20 °C and + 50 °C temperature limits
- Keep away from direct sunlight
- Caution: consult the accompanying documents for important safety-related information such as warnings and precautions that cannot be presented on the device itself for various reasons.
- Do not use if the packing material is damaged
- Keep dry

5.3 Disposal

The unit contains reusable materials. All components (except for the HEPA filter) can be discarded after having been cleaned and disinfected.

Please note that the HEPA filters must be discarded following the applicable national regulations for particular solid waste.



The device may have been used for treating and processing infectious substances. Therefore, the device and device components may have been contaminated.

Before disposal, all device components must be decontaminated.

Clean the device components thoroughly and either disinfect or decontaminate them.

6 Accessories supplied

- 1 HEPA filter for input gas supply (2 x HEPA filters for MAW with gas mixer)
- 1 USB stick containing Esco Medical Datalogger software and PDF versions of the manuals
- 1 gas hood (MAW without compartments) – 2 gas hoods for MAW 6ft Dual
- 1 carry tray (for 1 MAW work zone; MAW with compartments – 1 carry tray for each compartment)
- 1 humidification bottle for MAW 4 ft or 2 humidification bottles for MAW 6 ft Dual
- 2 medical grade power cord for the MAW 4 ft, or 3 medical grade power cords for MAW 6ft Dual

7 Safety symbols and labels

Several user labels on the surface of the MAW, Multi-zone ART Workstation, guide the user. User labels are shown below.

Table 7.1 Labels

Description	Image
<p>Packing box label:</p> <ol style="list-style-type: none"> 1. If stored longer than the shelf life, the unit must be returned to the manufacturer for a new release test. 2. Shipping temperature between -20 °C and +50 °C. 3. Keep away from direct sunlight. 4. Caution: consult the accompanying documents for important safety-related information such as warnings and precautions that cannot be presented on the device itself for various reasons. 5. Consult instructions for proper use of the device. 6. Do not use it if the packing material is damaged. 7. Rx Only. 8. Keep dry. 	<p>The diagram shows a rectangular label with the following elements: <ul style="list-style-type: none"> 1. Text: "This device must be installed before _____ else contact the manufacturer" 2. Temperature range: -20°C to +50°C with a thermometer icon. 3. Sunlight warning: A sun icon with rays. 4. Caution symbol: A triangle with an exclamation mark. 5. Information symbol: An open book with an 'i' icon. 6. Rx Only symbol: A circle with 'Rx' and 'Only' text. 7. Dry symbol: An umbrella with raindrops. 8. Recycle symbol: A circular arrow. </p>
<ol style="list-style-type: none"> 1. Consult instruction for use. 2. Warning on the back of the device indicates that an earth connection is needed and the mains information and an "ON/OFF" push button. 3. "Lightning bolt" indicates the potential risk of electrical shock (never remove any cover). 	<p>The diagram shows a rectangular label with the following elements: <ul style="list-style-type: none"> 1. Title: "Operating instructions" with an information icon. 2. Warning: "Warning: equipment must be earthed" 3. Electrical hazard symbol: A lightning bolt in a yellow triangle. 4. Technical specifications: "220- 240 V, 50/60Hz, 553W" 5. Fuses: "Fuses: 2xT3.15A-250V" </p>

1. Model. 2. Mains power rating. 3. CE mark. 4. Not protected against the ingress of water. 5. Manufacturer's address and country of origin. 6. View instruction for use. 7. Observe WEEE. 8. Upper limit of temperature. 9. Keep away from direct sunlight. 10. Keep dry. 11. Logo and serial number. 12. Year of manufacture. 13. Rx only	<p>MAW Workstation</p> <p>1 MODEL: MAW- 6D8</p> <p>2 MAINS: 220- 240 V, 50/60 Hz, 553W</p> <p>5 Esco Medical Technologies Draugystes 19, Kaunas 51230 Lithuania</p> <p>3 CE</p> <p>4 IPX0</p> <p>11 ESCO MEDICAL</p> <p>6 Consult instruction for use</p> <p>8 30°C Upper limit of temperature</p> <p>9 Keep away from direct sunlight</p> <p>7 Not for general waste</p> <p>10 Keep dry</p> <p>13 </p> <p>11 SN: _____</p> <p>12 2021</p>
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Table 7.2 Labels on the MAW, Multi-zone ART Workstation

Description	Image
PT 1000 validation sensors	
PC on/off button	
Compartments numbers are indicated in the top corner of the lid with a label (only MAW with compartments)	
Gas inlet on table plate (only MAW without compartments)	
Ethernet	

8 Important safety instructions and warnings

8.1 Before installation

1. Do not use the product if the package is damaged. Contact Esco Medical or the local representative.
2. Read the User manual thoroughly before use.
3. Always keep these instructions easily accessible near the device.
4. Do not try to lift heavy equipment alone.
5. If a forklift is used, only lift on the custom-built pallet. The tabletop itself cannot withstand any lifting in the middle. Permanent damage will occur. Warranty void if this happens.
6. The electronics box under the tabletop is not flush with the rest of the underside. Any blows can result in permanent damage. Warranty void if this happens.

8.2 During installation

1. Never place this unit on top of other equipment that might heat it.
2. Place this unit on a flat, hard and stable surface.
3. Never place the unit on a carpet or similar surfaces.
4. Do not defeat the safety purpose of the grounding-type (earthing) plug.
5. A grounding-type (earthing) plug has two blades and a third prong is provided for your safety. If the provided plug does not fit into your outlet, consult an electrician to replace the outlet.
6. Always connect the power cord to a properly grounded outlet and only use the cord that came with the device.
7. Do not install the device near any heat sources such as radiators, heat registers, stoves or other apparatus that produce heat.
8. Do not use this device near water sources.
9. Always use an external HEPA filter for input CO₂ or premixed gases.
10. Do not use this product at temperatures exceeding 30°C.
11. Place this unit in a location with adequate ventilation to prevent internal heat build-up. Leave at least 10 cm clearance from the rear, 30 cm from the top and 20 cm from left and right to prevent overheating and allow access to the ON/OFF switch in the back.
12. This unit is intended for indoor purposes only.
13. Read the section about EMC in this User manual on section 27 and heed the warnings.

8.3 Post-installation

1. Refer all servicing to qualified service personnel.
2. Servicing is required according to the service manual and when the device has been damaged in any way, e.g., if the apparatus has been dropped, exposed to rain or moisture, or does not operate normally. The MAW, Multi-zone ART Workstation, contains high voltage components that may be hazardous.
3. Unplug this device during lightning storms or when unused for an extended period of time.
4. Protect the power cord from being walked on or pinched, particularly at the plug, convenience receptacles and the point where it exits from the apparatus.
5. Perform temperature and gas calibration at the intervals described in the manuals.
6. NEVER block gas supply holes in the tabletop.
7. Ensure that CO₂ or premixed gas supply pressures are kept stable between 0.4 – 0.6 bar (5.80 – 8.70 PSI).

9 Getting started



The MAW, Multi-zone ART Workstation must be installed by authorized and trained personnel only!

1. Follow the guidelines in the safety instructions and warnings section.
2. Connect the mains cable to the top of the Workstation for the fan unit to work.
3. Connect the mains cable to the table top's underside for the PC and tabletop heating system to work.
4. Connect the gas lines.
5. Set gas pressure on the external gas regulator between 0.4 – 0.6 bar (5.80 – 8.70 PSI).
6. Switch on the MAW, Multi-zone ART Workstation with the switch under the tabletop (next to the mains cable).
7. Power up the PC by pressing the button in the middle of the inner wall work area.
8. Observe for standard functionality.
9. Let the unit warm up and stabilize for 20 min.
10. Follow the guidelines in the Validation guide.
11. Complete user training and finish reading instructions.
12. After a burn-in phase of 24-hours, the unit is ready to be used IF testing is successful.



Clean and disinfect the device before use. It is not delivered sterile or in a clinically acceptable clean state. Look through the cleaning instructions section in this manual for the manufacturer's recommended guidelines!

10 Mains connection

The MAW, Multi-zone ART Workstation, comes with a detachable mains power cord. The power cord is prepared for the country in which the unit is intended to be used.



Do not defeat the safety purpose of the grounding-type plug! A grounding type plug has two blades and a prong, which is provided for your safety. If the provided plug does not fit into your outlet, consult an electrician to replace the outlet.

The power requirement is 230V 50 Hz OR 115V 60Hz. The built-in power supply has a switch-mode that automatically adjusts to the correct mains power between 100V-250V AC 50-60 Hz.



Figure 10.1 Power supply

11 Gas connection and the humidification system

Under the SINGLE tabletop, one single gas input (black and blue) is located, whereas, under the DUAL tabletop, two single gas inputs are located.

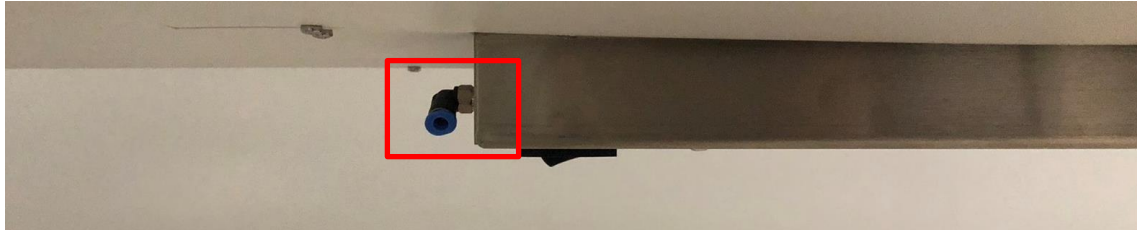



Figure 11.1 Gas inlet under Single tabletop

 **Gas pressure for inlet should be 0.4 – 0.6 bar (5.80 – 8.70 PSI) and it must be kept stable!**

Always use a high-quality pressure regulator for both gases that can be set with the required precision.



Figure 11.2 Pressure regulator

Connect the CO₂ gas to the CO₂ inlet with a suitable silicone tube. Ensure the tube is fastened with a clip so that it does not accidentally loosen itself during sudden pressure fluctuation. Use the supplied 0.2μ HEPA filter on the gas line just before the inlet on the MAW, Multi-zone ART Workstation. Notice the flow direction.



Figure 11.3 Gas filter

The CO₂ inlet should be connected to a 5% or 6% premixed CO₂.

The gas flow can be controlled digitally with the keys on the tabletop.

The gas will pass through the humidification system.



Figure 11.4 Humidification flask

Humidification flask tubes are marked with the number 1 and 2. Same have labeled two outlets. Flask tubes must be connected to outlets according to their number (number “1” tube and connect to the outlet marked with the same number).



Figure 11.5 Tubes connected to the flask

👉 If no humidification is required or wanted, a U-looped silicone tube must be put from the port marked “Outlet” to the port below; or simply empty bottle without water installed.

Fill the flask with sterile water.

11.1 MAW without compartments

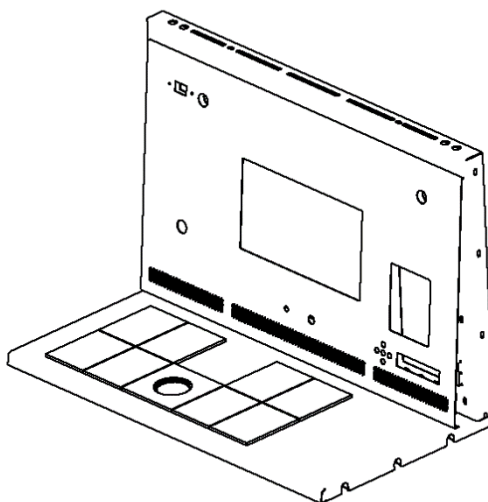


Figure 11.6 Choose gas from the nozzle

The gas will flow through the nozzle in the tabletop work area.

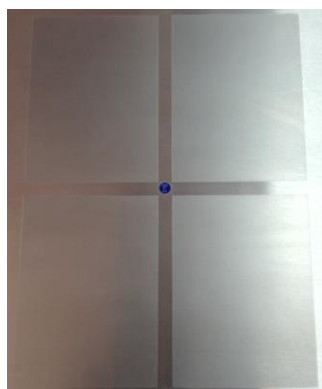


Figure 11.7 Gas nozzle in tabletop

A gas hood must be placed over the outlet. The constant flow will flush the environment so that a correct CO₂ concentration can be kept and thus, no pH drift will occur.



Figure 11.8 Gas hood placed over the gas nozzle

Keep the lids on the dishes when they are placed under the gas hood. The dishes can be placed directly on the warmed surface. A heating optimization plate can also be used. With the Carry Tray, several dishes can be conveniently being transported between a CO₂ incubator and the MAW.



Figure 11.9 Carry Tray

11.2 MAW with compartments

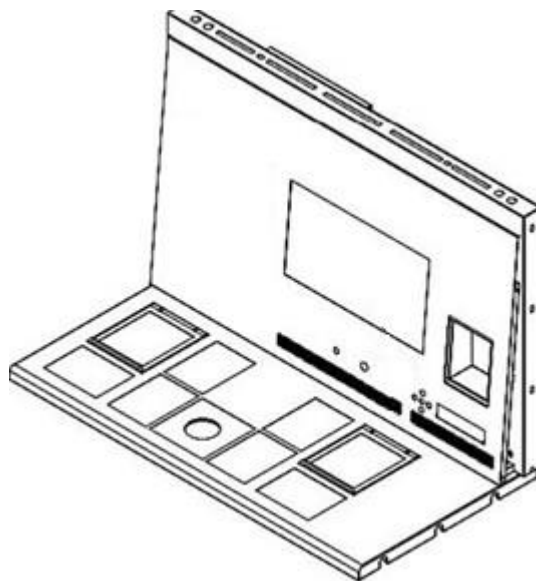


Figure 11.10 MAW with compartments

The gas will flow through and circuit in both compartments by the internal FAN. The FAN will automatically start when the flow is set.

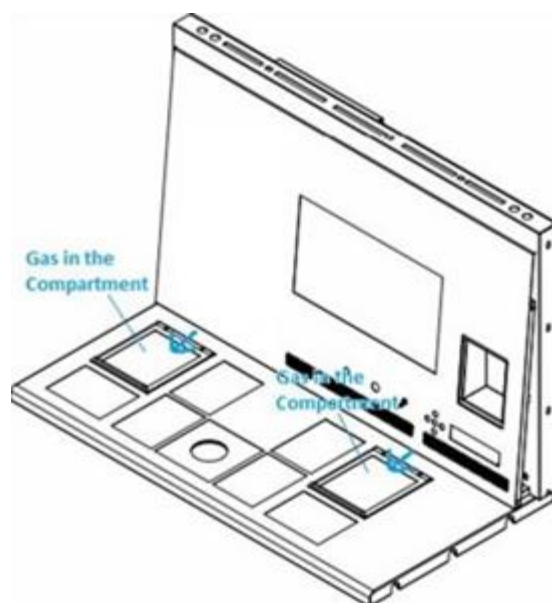


Figure 11.11 Gas in compartments

Gas system overview

Required input gas type: premixed CO₂ gas. Check medium types for the correct mixture and validate the mixture with a gas analyzer before use.

Required input gas pressure: gas pressure on the external source should be 0.4 – 0.6 bar (5.80 – 8.70 PSI) and must be kept stable.

If the pressure falls below 0.3 bar (4.40 PSI) or rises above 0.7 bar (10.20 PSI), it will trigger the gas pressure alarm. In case of an alarm, remove the sample to a safe CO₂ incubator and investigate the alarm's cause.

The gas flow setpoint can be adjusted in the range from 0 l/h to 40 l/h (with 1 l/h increment).

When the gas flow is active, the user can turn on the “Purge” function by pressing the up (↑) key when the status in the menu shows the “FLW 1”. The gas flow will be switched on for 5 min 40 l/h.

The correct flow is a balance towards maintaining the pH level in the gas usage medium and economy. With increased flow, there is an increased likelihood of correct gas level and fast gas recovery. It also increases gas costs. So, the flow can be adjusted to a level where the medium's pH is still maintained and the gas consumption is as low as possible. Only a validation test locally can decide this for the specific medium. Also, check the medium manufacturer's recommendations.

11.3 MAW with compartments and built-in gas mixer

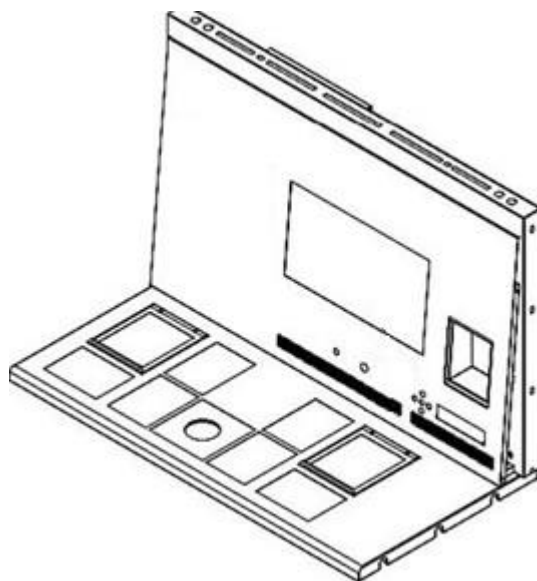


Figure 11.12 MAW with compartments and built-in gas mixer

The gas will flow through and circuit in both compartments by the internal FAN. CO₂ and O₂ sensors will provide gas concentration control.


Gas system overview


Required input gas type: pure CO₂ and N₂ gas. Also, there is a possibility to use premixed CO₂ gas.

Required input gas pressure: gas pressure on the external source should be 0.4 – 0.6 bar (5.80 – 8.70 PSI) and must be kept stable.

If the pressure falls below 0.3 bar (4.40 PSI) or rises above 0.7 bar (10.20 PSI), it will trigger the gas pressure alarm. In case of an alarm, remove the sample to a safe CO₂ incubator and investigate the alarm's cause.

The CO₂ gas concentration setpoint can be adjusted from 3.0% to 10.0% (with a 0.1 % increment). The N₂ gas concentration setpoint can be adjusted from 5.0% to 20.0%. An audible alarm will start when the gas concentration in compartments differs $\pm 1\%$ from the setpoint.

 **If premixed gas is intended to be used instead of pure gas, refer to trained personal for help!**

 **The O₂ setpoint must be 2% higher than the premixed gas measured value gas**

(i.e., 7.0% if 5.0% measured).

 Be advised that premixed gas consumption will be significantly higher compared to pure gas. Recover to the setpoint will be longer.

12 User interface

The main keys and their purpose are presented in table 12.1.

Table 12.1 The main keys and their purpose

Description	Image
Main keys	
ON/OFF keys Located in the REAR of the unit	
Alarm key It is used to mute an audible alarm and visually indicate the alarm condition by a flashing red circle of light. The audio alarm will automatically come back on after 5 min. It can be muted again.	
Display panel Shows the information on the current status of the unit. The display consists of 7 x high brightness 16 segment LEDs. The 1 st is red, which indicates a user warning. The other 6 are blue and used to display normal running conditions.	
Setpoint key It is used to select items on the menu to change their status. It is also used to change the temperature and gas setpoints	
Arrow keys up, down & right They are used to navigate through the menu and change the values for temperature and gas concentrations	

12.1 Activating heat and gas controls

The main controls are activated using the “ON/OFF” switch under the tabletop.

12.2 System menu

Press and hold (↑) and (↓) keys together for 3 seconds to access the menu.

Navigate in menu using:

- Arrow right (⇒) key = enter
- Up (↑) and Down (↓) arrow keys= previous OR next
- SP/Enter key = change OR accept

Press and hold (↑) and (↓) keys together for 3 seconds to exit the menu entirely.

12.3 Status


12.3.1 Models without a built-in gas mixer

Soon after system activation, the main display will alternate the reading between the following parameters. Scroll between the parameters with the (⇒) key.



There will be an additional culture mode parameter in the MAW, Multi-zone ART Workstation, and models with compartments. The display will show:



 If the use mode is Open Culture (no oil or Paraffin overlay culture), the culture mode shall be set for that and will display:

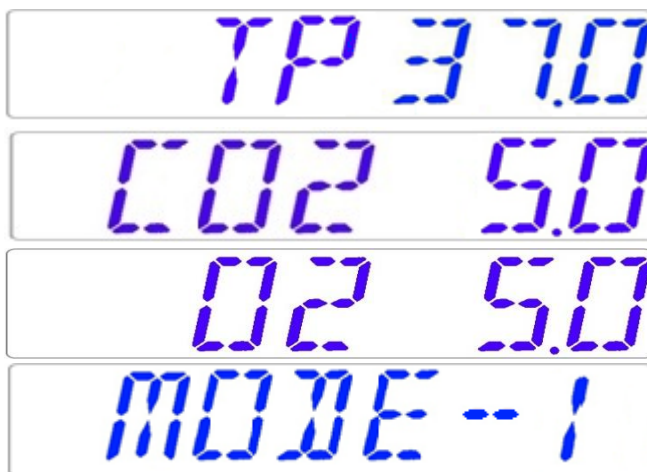


If the MAW, Multi-zone ART Workstation has compartments, after the display shows “TP 37.0”, the user can see compartments temperature by pressing the (↑) key. Then the display will show:



12.3.2 Models with a built-in gas mixer

Soon after system activation, the main display will alternate the reading between the following parameters. Scroll between the parameters with the (⇒) key.



👉 If the O₂ regulator is deactivated, the system will display “O2 OFF”.



If the MAW, Multi-zone ART Workstation, has compartments, there will be an additional culture mode parameter:



👉 If the use mode is Open Culture (no oil or Paraffin overlay culture), the culture mode shall be set for that and will display:



If the MAW, Multi-zone ART Workstation has compartments, after the display shows “TP 37.0”, the user can see compartments temperature by pressing the (↑) key. Then the display will show:



12.4 Main menu

There are two different main menus in the MAW, Multi-zone ART Workstation: without a built-in gas mixer and with a built-in gas mixer.

12.4.1 Main menu (only for models without a built-in gas mixer)

Press the (⇒) key to enter the menu.

You can exit the menu by pressing the (↑) key.



Temperature is the first category when you enter the menu.

Press the (⇒) key to enter the Temperature sub-menu.



Press the (↓) key to scroll to the last category on the menu.

Press the (⇒) key to enter the Service sub-menu.



12.4.2 Main menu (only for models with a built-in gas mixer)

Press the (⇒) key to enter the menu.

You can exit the menu by pressing the (↑) key.



Temperature is the first category when you enter the menu.
Press the (⇒) key to enter the Temperature sub-menu.



Press the (↓) key to scroll further down in the menu.
Press the (⇒) key to enter the CO₂ sub-menu.



Press the (↓) key to scroll further down in the menu.
Press the (⇒) key to enter the O₂ sub-menu.



Press the (↓) key to scroll to the last category on the menu.
Press the (⇒) key to enter the Service sub-menu.



12.5 Sub-menus

12.5.1 Temperature sub-menu

Press the (⇒) key on the temperature menu to enter the temperature sub-menu.
Calibrate holding down the SP key and using (↑) and (↓) keys to adjust.



Move to the next sub-menu item with (↓) key or one step up with (↑) key.

Example – how to calibrate the temperature:

The temperature has to be measured with a suitable and calibrated device. With a quality thermometer, it has been estimated that T1 is 37.4 °C. Locate “T1 CAL” in the sub-menu and press and hold the SP key. The display should show:

A digital display showing the text "T1 37.0" in a blue, segmented font. The "T1" is on the left and "37.0" is on the right, with a small space between them.

Adjust the temperature by pressing the (↑) key 4 times while still holding the SP key down. The display will show the steps from 37.1, 37.2, 37.3 and 37.4. When temperature equals the measured temperature, let go of the SP key. The value is stored and the temperature sensor for the T1 area has been modified.

 **Calibration procedure is the same for T1 – T12.**

12.5.2 CO₂ sub-menu (only for models with a built-in gas mixer)

Press the (⇒) key on the CO₂ menu to enter the CO₂ sub-menu.
The first item in the O₂ sub-menu is O₂ sensor calibration:

A digital display showing the text "CO2CAL" in a blue, segmented font. The "CO2" is on the left and "CAL" is on the right, with a small space between them.

Calibrate CO₂ by holding down the SP key and using (↑) and (↓) keys to adjust.
Move to the next CO₂ sub-menu item with (↓) key or one step up with (↑) key.

A digital display showing the text "CO2REG" in a blue, segmented font. The "CO2" is on the left and "REG" is on the right, with a small space between them.

Toggle CO₂ regulation on/off by holding the SP key and pressing (↑) or (↓) keys.

Two digital displays stacked vertically. The top display shows "CO2 ON" and the bottom display shows "CO2 OFF", both in a blue, segmented font. The "CO2" is on the left and "ON" or "OFF" is on the right, with a small space between them.

 **The default status for the CO₂ control is OFF.**

Move to the next CO₂ sub-menu item with (↓) key or one step up with (↑) key.

CO₂ flow rate is shown (it cannot be adjusted):



It shows the amount of CO₂ gas put into the system while regulating. The volume is shown in liters/hour. It usually will fluctuate along with the CO₂ regulation.

Press the (↓) key to move to the next item in the CO₂ sub-menu. CO₂ internal pressure rate is shown (it cannot be adjusted on the incubator. It is adjusted on the external gas regulator):



The value is in bar and it must be 0.4 – 0.6 bar (5.80 – 8.70 PSI) at all times.

Example – how to calibrate CO₂:

CO₂ gas concentration has to be measured with a suitable and calibrated device. The real CO₂ concentration has been estimated to be 5.4% on the gas sample port.

Locate “CO₂ CAL” in the CO₂ sub-menu and press the SP key. The display will show:



Adjust the calibration to the desired level by pressing (↑) or (↓) keys. In this case, we want to adjust to 5.4%. Press (↑) key 4 times. The display will show 5.0, 5.1, 5.2, 5.3 and 5.4. When CO₂ equals measured CO₂, let go of the SP key. The value is stored and the CO₂ sensor calibration has been modified.

👉 **Pure CO₂ 100% gas recovery till 5% is less than 4 minutes.**

👉 **Calibration is done by adjusting the CO₂ level according to a measurement taken from the gas sampling outlet, using a precision CO₂ measurement device only.**

⚠ **Calibration values should only be changed based on measurements taken by a trained user or technician.**

12.5.3 O₂ sub-menu (only for models with a built-in gas mixer)

Press the (⇒) key on O₂ to enter the O₂ sub-menu.

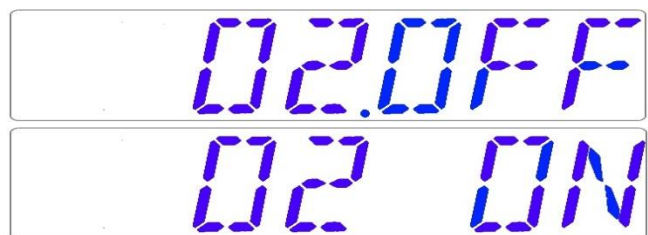
The first item in the O₂ sub-menu is O₂ sensor calibration:

A digital display with a blue LED font showing the text "O2CAL".

Calibrate O₂ by holding down the SP key and using (↑) and (↓) keys to adjust.
Move to the next O₂ sub-menu item with (↓) key or one step up with (↑) key.

A digital display with a blue LED font showing the text "O2REG".

Toggle O₂ regulation on/off by holding the SP key and pressing (↑) or (↓) keys.

Two digital displays with blue LED font. The top display shows "O2OFF" and the bottom display shows "O2 ON".

 **The Default status for the O₂ control is OFF.**

Move to the next O₂ sub-menu item with (↓) key or one step up with (↑) key.

N₂ flow rate is shown (it cannot be adjusted):

A digital display with a blue LED font showing the text "FLOW 10".

It shows the amount of N₂ gas put into the system while regulating. The volume is shown in liters/hour. It usually will fluctuate along with the O₂ regulation.

Press (↓) key to move to the next item in the O₂ sub-menu.

O₂ internal pressure rate is shown (it cannot be adjusted on the incubator. It is adjusted on the external gas regulator):



The value is in bar and it must be 0.4 – 0.6 bar (5.80 – 8.70 PSI) at all times.

Example – how to calibrate the O₂:

O₂ gas concentration has to be measured with a suitable and calibrated device. The real O₂ concentration has been estimated to be 5.3% on the gas sample port.

Locate “O₂ CAL” in the O₂ sub-menu and press the SP key. The display will show:



Adjust the calibration to the desired level by pressing (↑) or (↓) keys. In this case, we want to adjust to 5.3%. Press (↑) key 3 times. The display will show 5.0, 5.1, 5.2 and 5.3. When O₂ equals measured O₂, let go of the SP key. The value is stored and the O₂ sensor calibration has been modified.

 **Calibration is done by adjusting the O₂ level according to a measurement taken from the gas sampling outlet, using a precision O₂ measurement device only.**

 **Calibration values should only be changed based on measurements taken by a trained user or technician.**

12.5.4 Service sub-menu

Press the (⇐) key on the service menu to enter the service sub-menu.
The service sub-menu is locked as default. The display will show:



Press (⇐) key and hold it for about 10 sec. Then the display will show the currently installed firmware version:




Ver 2.0 is only shown as an example. Consult Esco Medical or the local representative for the number of the latest version.

Move to the next service sub-menu item with (↓) key or one step up with (↑) key.

If the MAW, Multi-zone ART Workstation, has a built-in gas mixer, there will be a “GAS” function under the service sub-menu. The display will show:



Press the (⇒) key to enter and press (↓) or (↑) keys to choose “PREMIX” or “CO₂/N₂”. Press the SP key and by pressing (↓) or (↑) keys, select “PREMIX” or “CO₂/N₂” gas mode. Let go of the SP key and the selected mode is now stored.

 **When using the premixed gas mode in the MAW, Multi-zone ART Workstation, model with a built-in gas mixer, it is necessary to use a premixed gas with higher gradation than the setpoint. For example, if you need to achieve a 5% CO₂ gas setpoint, premixed gas should have 7% CO₂ in its mixture.**

Press (↑) to exit back into the menu.

13 Alarms

The display will show a red “A” and the affected parameter's status message on a single fault condition. An audio signal can be muted by pressing the alarm key once (toggled on/off for 5-minutes). There will be a red arrow that indicates if the alarm is triggered due to too high or too low values, and the audio on/off key will blink red:




Figure 13.1 Alarm key which indicates the alarm condition

The audio pattern is 3 short beeps followed by a 3-second pause. All alarms have the same audio pattern.

13.1 Temperature alarms

All 12 heating zones can trigger a temperature alarm if their temperature varies over ± 0.5 °C from the setpoint.

 **Remember that changing the setpoint more than ± 0.5 °C from the current temperature will result in an alarm. The same goes for all calibration adjustments.**

The number will indicate the zone triggering the alarm following “A”.

Temperature is too high in compartment 3:



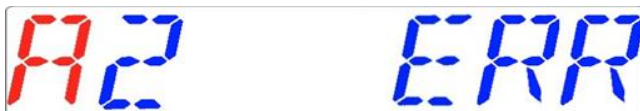
Temperature is too low in compartment 1:



The display will lock-on the alarm condition and will stop alternating between the standard status messages. If the mute key is pressed, the display will shift to normal status and show the parameters for 5 minutes until the audio alarm comes back on again. The mute alarm key will still show the alarm condition by blinking red while the alarm is muted.

The zone layout and sensor placement are described in the section “15 Surface temperatures and measuring temperature”.

If a temperature sensor malfunctions, it will be indicated by the following warning:



It denotes that the sensor in compartment 2 has failed. As a safety precaution, the heating of the affected area will be switched off.

13.2 Gas level alarms (only for models with a built-in gas mixer)

13.2.1 CO₂ alarms

The CO₂ gas level alarm is activated if the concentration of the CO₂ gas deviates more than $\pm 1\%$ from the setpoint.

 **Remember that changing the setpoint more than $\pm 1\%$ from the current gas level will result in a gas level alarm. The same goes for all calibration adjustments.**

CO₂ gas % is too low:



CO₂ gas % is too high:



The display will lock-on the alarm condition and will stop alternating between the standard status messages. If the mute key is pressed, the display will shift to normal status and show the parameters for 5 minutes until the audio alarm comes back on again. The mute alarm key will still show the alarm condition by blinking red while the alarm is muted.

13.2.2 O₂ alarms

The O₂ gas level alarm is activated if the concentration of the O₂ gas deviates more than $\pm 1\%$ from the setpoint.

 **Remember that changing the setpoint more than $\pm 1\%$ from the current gas level will result in a gas level alarm. The same goes for all calibration adjustments.**

O₂ % is too low:



O₂ % is too high:



The display will lock-on the alarm condition and will stop alternating between the standard status messages. If the mute key is pressed, the display will shift to normal status and show the parameters for 5 minutes until the audio alarm comes back on again. The mute alarm key will still show the alarm condition by blinking red while the alarm is muted.

13.3 Gas pressure alarms

13.3.1 CO₂ pressure alarm

If the CO₂ gas supply is not attached correctly or incorrect CO₂ gas pressure is applied to the system, MAW, Multi-zone ART Workstation will go into CO₂ pressure alarm mode. The display will show “CO₂ P”, which indicates an incorrect incoming gas pressure. If the pressure falls below 0.3 bar (4.40 PSI) or rises above 0.7 bar (10.20 PSI), it will trigger the alarm.



 “P” stands for pressure.

The display will lock-on the alarm condition and will stop alternating between the standard status messages. If the mute key is pressed, the display will shift to normal status and show the parameters for 5 minutes until the audio alarm comes back on again. The mute alarm key will still show the alarm condition by blinking red while the alarm is muted.

13.3.2 N₂ pressure alarm (only for models with built-in gas mixer)

If the N₂ gas supply is not attached correctly or incorrect N₂ gas pressure is applied to the system, MAW, Multi-zone ART Workstation will go into N₂ pressure alarm mode. The display will show “N₂ P”, which indicates an incorrect incoming gas pressure. If the pressure falls below 0.3 bar (4.40 PSI) or rises above 0.7 bar (10.20 PSI), it will trigger the alarm.



 “P” stands for pressure.

The display will lock-on the alarm condition and will stop alternating between the standard status messages. If the mute key is pressed, the display will shift to normal status and show the parameters for 5 minutes until the audio alarm comes back on again. The mute alarm key will still show the alarm condition by blinking red while the alarm is muted.

13.4 Multiple alarms

When there are two or more alarms, the display will indicate this by showing first “A MULTI” and then the alarm conditions:



The flow will be forced according to the alarms. The temperature alarms have 1st priority, gas level alarms 2nd, and pressure 3rd.

14 Changing the setpoints and heated mode

14.1 Temperature setpoint

The temperature setpoint can be adjusted in the range from 25 °C to 40.0 °C.

 **The default temperature setpoint is 37.0 °C.**

To change the temperature setpoint, follow these instructions:

1. When the display shows the current temperature:



2. Hold down the SP key and use (↑) and (↓) keys to adjust the setpoint: one keypress corresponds to a 0.1 change.
3. After changing the temperature, let go of the SP key. The value is now stored.

If the display does not show the current temperature reading, the (⇒) key will toggle between temperature, gas flow setpoint and heated mode.

14.2 Gas flow setpoint (only for models without a built-in gas mixer)

The gas flow setpoint can be adjusted in the range from 0 l/h to 40 l/h.

To change the gas flow setpoint, follow these instructions:

1. When the display shows the current gas flow:




2. Hold down the SP key and use (↑) and (↓) keys to adjust the setpoint: one keypress corresponds to a 1 l/h change.
3. After changing the temperature, let go of the SP key. The value is now stored.

If the display does not show the current gas flow setpoint reading, the (⇌) key will toggle between temperature, gas flow setpoint and heated mode.

14.3 CO₂ gas concentration setpoint (only for models with a built-in gas mixer)

The CO₂ concentration can be adjusted in the range between 3.0% to 10%.

 **The default CO₂ setpoint is 5.0%.**

To change the CO₂ concentration setpoint, follow these instructions:

1. When the display shows the CO₂ gas concentration:




2. Hold down the SP key and use (↑) and (↓) keys to adjust the setpoint: one keypress corresponds to a 0.1 change.
3. After changing the temperature, let go of the SP key. The value is now stored.

If the display does not show the current CO₂ reading, the (⇌) key will toggle between the temperature, CO₂, O₂ and heated mode readings.

14.4 O₂ gas concentration setpoint (only for models with a built-in gas mixer)

The O₂ concentration can be adjusted in the range between 5.0% to 20.0%.

 **The default O₂ setpoint is 5.0%.**

To change the O₂ concentration setpoint, follow these instructions:

1. When the display shows the O₂ concentration:



2. Hold down the SP key and use (↑) and (↓) keys to adjust the setpoint: one keypress corresponds to a 0.1 change.

3. After changing the temperature, let go of the SP key. The value is now stored.

If the display does not show the current O₂ reading, the (⇌) key will toggle between the temperature, CO₂, O₂ and heated mode readings.

14.5 Heated Mode

The table plate has 4 heated modes.

To change heated mode, follow these instructions:

1. When the display shows the current heated mode:



2. Hold down the SP key and use (↑) and (↓) keys to adjust the heated mode.
3. After changing the temperature, let go of the SP key. The mode is now stored.

Mode 1:

All zones are “ON” and controlled. The zones are heated up to the temperature setpoint.

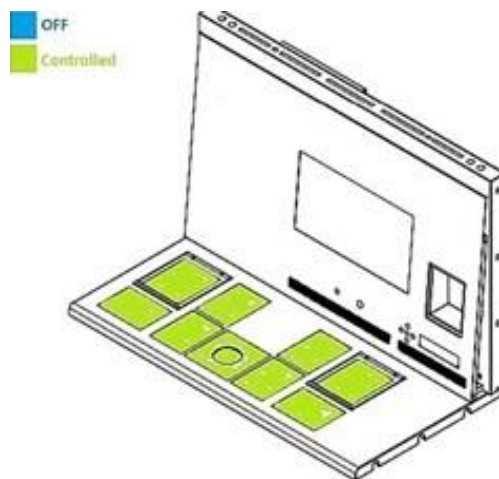


Figure 14.1 Mode 1

Mode 2:

Both compartments are “ON” and controlled.

The left side and the middle zone are “ON” and controlled.

The right side of the area is “OFF”; as shown in the picture below, all other zones are heated up to the temperature setpoint.

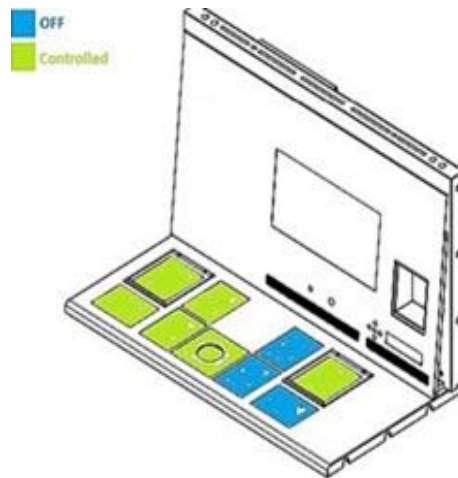


Figure 14.2 Mode 2

Mode 3:

Both compartments and the left side of the table plate are “ON” and controlled.

The middle zone and right-side area are “OFF”, as shown in the picture below.

All other zones are heated up to the temperature setpoint.

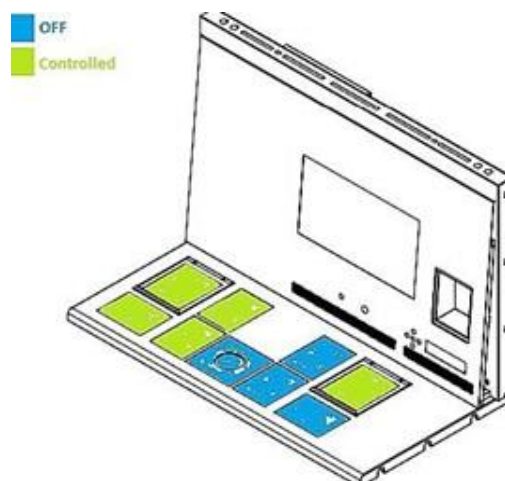


Figure 14.3 Mode 3

Mode 4:

Both compartments are “ON” and controlled.

The rest of the table plate is “OFF,” as shown in the picture below.

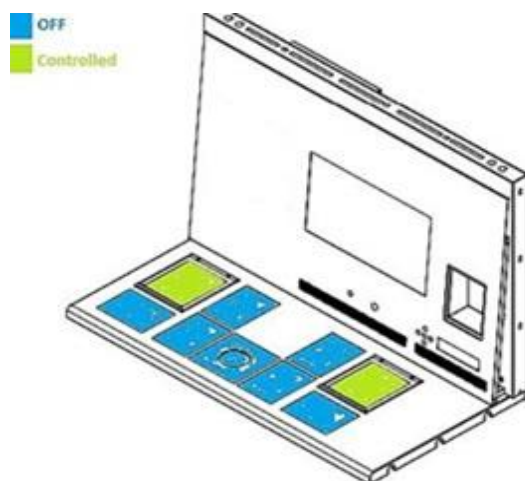


Figure 14.4 Mode 4

15 Surface temperatures and measuring temperature

In this section, MAW, Multi-zone ART Workstation temperature controls system is described in more detail.

MAW, Multi-zone ART Workstation is equipped with 12 completely separate PID controllers for temperature measurement. Each controller is responsible for controlling the temperature of a separate area.

Each of the 12 available areas is equipped with its separate temperature sensor and heater, allowing the user to adjust the temperature in every area separately, thus achieving higher precision.

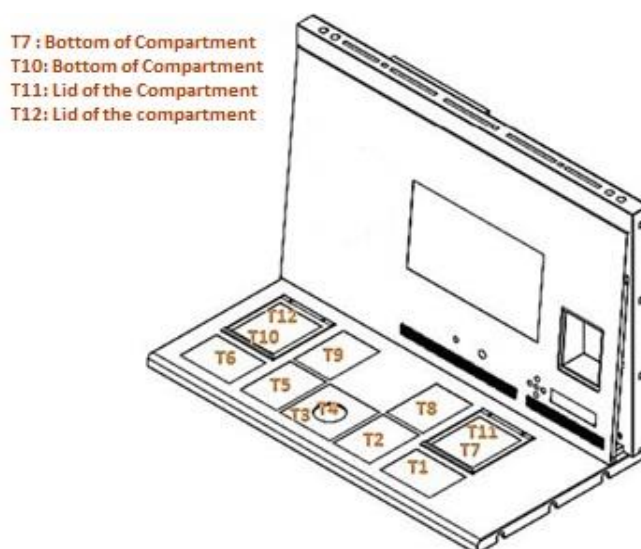


Figure 15.1 PID controllers on the table plate

Each area can be calibrated separately, using the item corresponding to the respective area in the menu. These items are placed in the menu and they are named: T1 CAL, T2 CAL, T3

CAL, T4 CAL, T5 CAL, T6 CAL, T7 CAL, T8 CAL, T9 CAL, T10 CAL, T11 CAL and T12 CAL.

To calibrate the temperature in a particular area, please find the corresponding sensor name and adjust it according to a measurement taken using a high-precision thermometer.

Esco Medical recommends only a suitable and calibrated device with a precision of at least 0.1 °C.



Temperature calibration is done by adjusting the Tx (where x is the sensor number) according to a measurement done on the spot relevant to the dish placement.



After temperature adjustment, give it at least 15 minutes for the temperature to stabilize, use the thermometer to verify the correct temperature on each area.



Tape the calibrated thermometer sensor to the middle of the zone. It may be necessary to do iterations before the zone is thoroughly calibrated.



Heating modes do not affect the compartments.

Be careful when changing the calibration settings – make sure that only the altered value corresponds to where the measurement is done. Give the system time to adjust.



There is no crossover heating between the 12 zones when adjusted to temperatures within 0.5 °C. At more considerable temperature differences, the hotter zone will affect the colder zone.

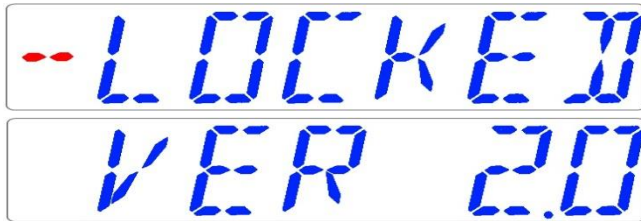
Note: how to calibrate the temperature at the T1 area can be found in this manual's 12.5.1 section.

16 Firmware

The firmware installed on your MAW, Multi-zone ART Workstation is upgradeable. Whenever a critical update is available, it will be provided to our distributors around the world – they will make sure that your incubator runs with the newest available firmware. A service technician can do this during the scheduled annual service.

Please follow these steps to check the firmware which is currently installed on your unit:

1. In the menu, locate the Service sub-menu “Serv” and press the (⇒) key to enter. The service sub-menu is locked as default. The display will show “LOCKED” and after pressing the (⇒) key and hold it for 10 sec, the display will show the currently installed firmware version:



Ver 2.0 is only shown as an example. Consult Esco Medical or the local representative for the number of the latest version.

2. Press the (⇧) key to exit back into the sub-menu.

17 The Laminar Flow

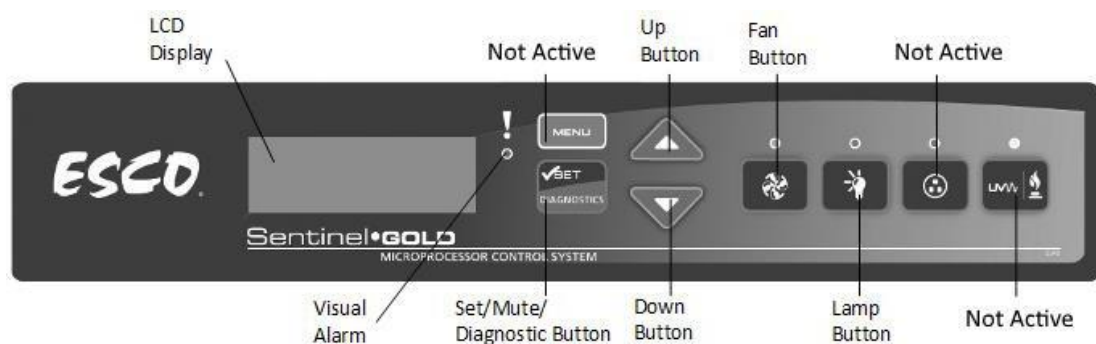


Figure 17.1 Main keys

- “Fan” button – turns on and turns off the fan. It activates standby mode.
- “Lamp” button – turns on and turns off the fluorescent lamps.
- “Socket” button – not active for the user.
- “UV/Gas” button – not active for the user.
- “Menu” button – enters the menu. It works like the “Back” button as well.
- “Set/Mute/Diagnostic” button – select folder/enter the parameter button.
- “UP/Down” buttons – scrolls through the menu.

Only 3 functions are available for the user: switching “ON/OFF” the laminar airflow, activating the standby flow mode and switching “ON/OFF” the interior light.

18 Cleaning instructions

18.1 Considerations about a sterile device

MAW, Multi-zone ART Workstation is not a sterile device. It is not delivered sterile state and it is not possible to keep them sterile while in use.

However, their design was created with great care to make it easy for the user to keep the device sufficiently clean during use and not contaminate the key components.

These cleaning instructions are for general-purpose use and have not been validated for sufficiency to cover all possible usage aspects and all imaginable use scenarios.

The design features intended to provide cleanliness are:

- A ULPA filtered laminar airflow
- A flush stainless-steel work surface
- Use of parts that withstand cleaning well

18.2 Manufacturer recommended cleaning procedure



Always validate the cleaning procedures locally; for more guidance, consult your manufacturer or the distributor.

The routine cleaning procedure is recommended for regular processing and maintenance. The combination of standard cleaning procedures and disinfection procedures is recommended for event-related concerns such as media spills, visual accumulation of soil and/or other evidence of contamination. It is also recommended to clean and disinfect MAW, Multi-zone ART Workstation immediately after any media spills.

Periodic cleaning of the device (with no embryos inside)

Wearing gloves and good handling techniques are essential to successful cleaning.

1. Power off the MAW, Multi-zone ART Workstation (underside panel).
2. It is recommended that the unit is cleaned with aqueous 70% isopropyl alcohol: moisten a sterile wipe and clean all internal and external surfaces of the device by rubbing the wipe on the surfaces.
3. Following cleaning, leave the compartment's lids (in MAW with compartments) open to allow sufficient time to ensure that all alcohol fumes have dissipated.
4. Finally, purified or sterile water is used to wipe the device surfaces.
5. Inspect the device: if visually clean, the device is ready for use.
6. Turn on the MAW, Multi-zone ART Workstation (underside panel).

If the device is not visually clean, repeat the process from step 2.

18.3 Manufacturer recommended disinfection procedure

Disinfection of the device (with no embryos inside)

The use of gloves and good handling techniques are essential for successful disinfection.

Proceed with the following steps (this procedure has been demonstrated during the on-site training program as part of the installation protocol):

1. Power off the MAW, Multi-zone ART Workstation (underside panel).
2. Open the lids (in MAW with compartments).
3. Use the required disinfectant to disinfect the internal surface and a glass plate on the lid's top. Use sterile wipes to apply the disinfectant.
4. Wipe all internal surfaces and the top of the lid with three wipes at least. Repeat until the wipes are not discolored.
5. Change your gloves, and after 10 minutes of contact time, spray sterile water on the surfaces and wipe them with a sterile wipe.
6. Inspect the device – if it is visually clean, consider it ready for use. If the device is visually not clean, go to step 3 and repeat the procedure.
7. Turn on the MAW, Multi-zone ART Workstation (underside panel).

19 Heat optimization plates

The Carry Tray heat optimization plate will ensure full contact with the dish. It generally means much more stable temperature conditions for the cells. The plate fits the area under the gas hood. The plate can be taken out for cleaning and serves as a convenient way to carry several dishes between the CO₂ incubator and the MAW, Multi-zone ART Workstation.



Do not use autoclave at the inserts. It will damage the inserts as high temperature bends them out of shape.

Place the dish where it fits the pattern. There are Carry Tray heat optimization plates for Nunc® or Falcon® dishes.



Use only the correct type of Carry Tray heat optimization plates for your dishes.



Figure 19.1 Carry Tray

20 Humidification

If the MAW, Multi-zone ART Workstation is used for open culture conditions, the humidification and gas hood are recommended.

If the MAW, Multi-zone ART Workstation is used for culture with a mineral overlay, it is unnecessary to use the humidification system.

21 Temperature validation

The single 4ft MAW, Multi-zone ART Workstation has equipped with 5 PT-1000 Class B sensors, whereas the dual 6ft MAW, Multi-zone ART Workstation – 9 PT-1000 Class B sensors. 5 sensors are on the left side of the table plate and 4 are on the table plate's right side.

Each zone has an extra sensor for validation (zone 1, 2, 3, 5, 6). These sensors are not connected to any of the electronics on the unit. The user can connect an external device to validate the temperature readings.

PT-1000 Class B sensors are located in the central positions of the bottom zones and are connected to a connector inside of the table plate as shown:

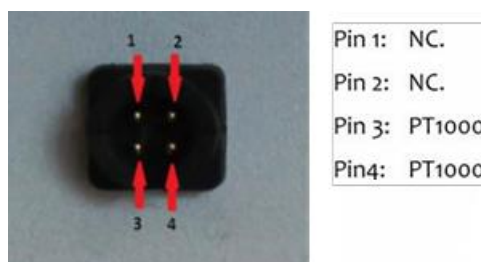


Figure 21.1 Pin

Esco Medical or your distributor can supply a connector and wire.

The zones' temperature conditions can be logged continually externally through the connectors without compromising the unit's performance. Any logging system that uses standard PT-1000 sensors can be used.

Esco Medical can supply an external logging system for the sensors.

22 All in one PC

The single MAW, Multi-zone ART Workstation is equipped with one powerful touch-enabled AIO PC, whereas dual MAW – 2 AIO PCs. Switch “ON/OFF” the PC by pressing the button below the screen.



Figure 22.1 The AIO PC screen in MAW

First, the PC will start and load the Windows operating system. The workstation logger surveillance software will automatically generate parameters, and warnings will be shown on the screen.

22.1 Data Logger Software

Under normal working conditions, on the PC display, the user should see numeric values.

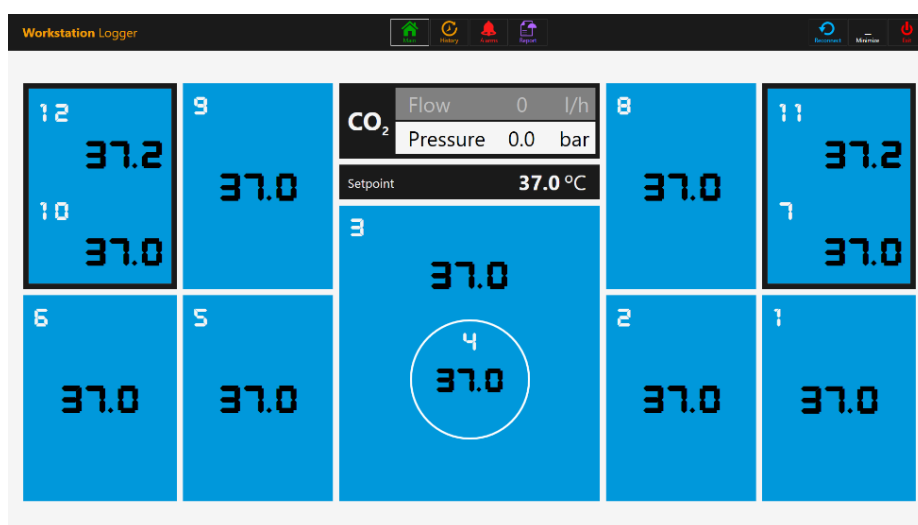


Figure 22.2 The Workstation Logger view under normal working conditions (without a gas mixer)

For MAW, Multi-zone ART Workstation models with a built-in gas mixer, the main display also shows CO₂ level, CO₂ flow, CO₂ pressure, O₂ level, N₂ flow, N₂ pressure, CO₂ and O₂ setpoints and both active gas mode (mix or premix) and culture mode (under oil culture or open culture).

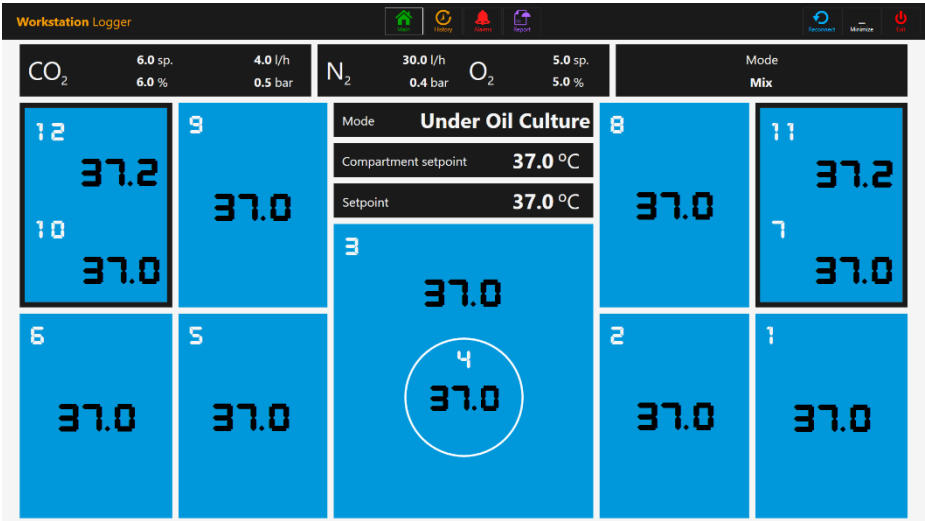


Figure 22.3 The Workstation Logger view under normal working conditions (with a gas mixer)

There is also a second display, with only shows culture mode, compartment setpoint and temperature setpoint.

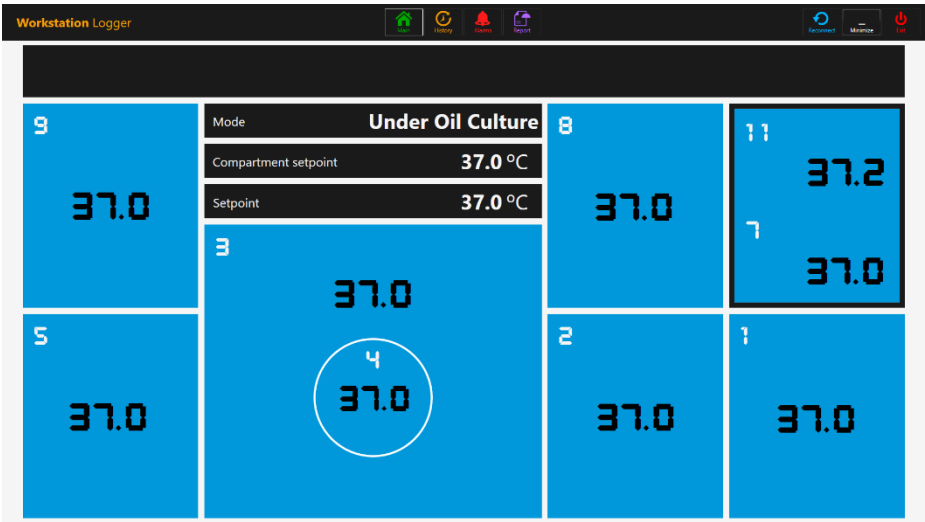


Figure 22.4 The Workstation Logger 2nd display view under normal working conditions (with a gas mixer)

If the signal is lost, dotted lines will appear instead of numeric values.



Figure 22.5 The Workstation Logger main view when the signal is lost

Once the signal is established, numeric values will be shown.

The blue color signifies that the zone is in normal operation mode. If there is an alarm, the color will shift to red on the relevant zone.

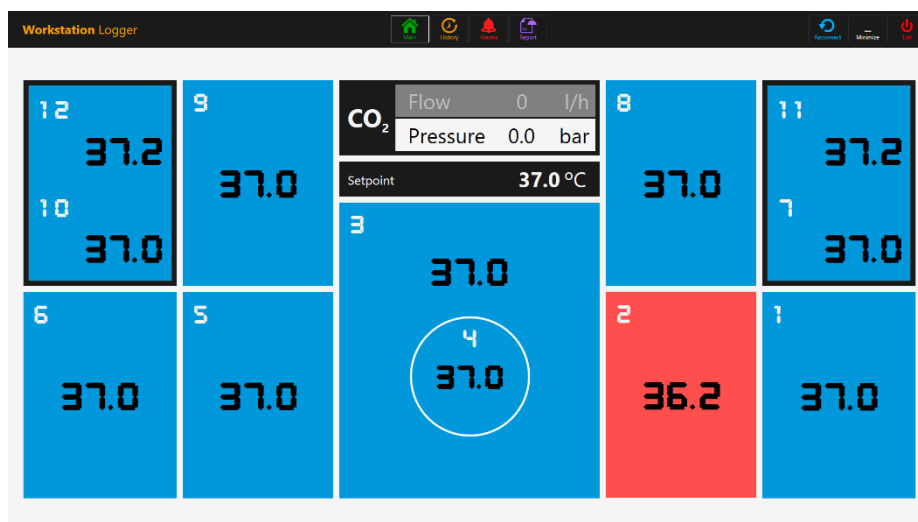


Figure 22.6 The Workstation Logger main view when there is a low-temperature alarm in the T2 area

In this way, the user will always have a clear visual indication of the regular operation and an easy way to identify and respond to a malfunction.

👍 This is a unique safety feature of the MAW, Multi-zone ART workstation, which cannot be found on any comparable system.

Some models of MAW, Multi-zone Workstations, contain compartments. In this case, the zone will have a black border and two temperature values (bottom and lid).

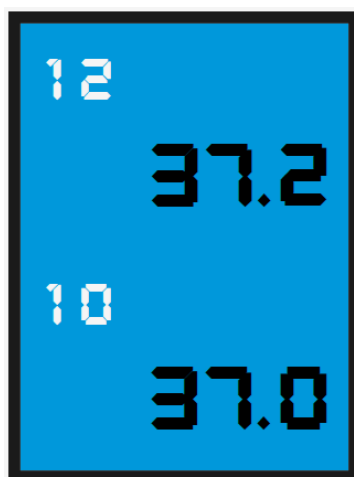


Figure 22.7 Compartment view in the Workstation Logger

At the top of the screen, 4 navigation buttons are placed in the middle and 3 actions buttons in the right-hand corner.

The “MAIN” button brings up the main view (shown in the 22.2 and 22.3 pictures above).

The “HISTORY” button toggles the graph view, where graphs can be shown for all the parameters. It is useful for documentation of the stability of the system and to identify errant behavior.

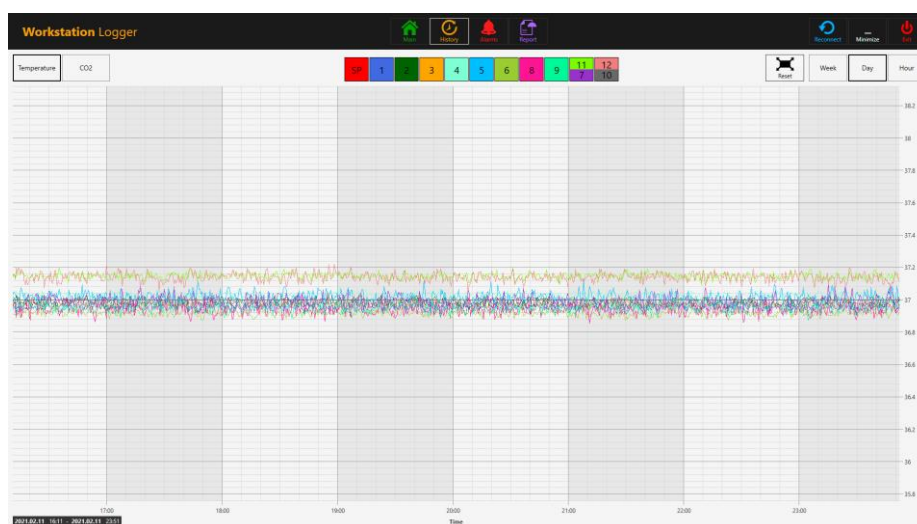


Figure 22.8 The “History” temperature data view

Several extra buttons appear in the graph view. By pressing the button with the number for the zone, the user can see temperatures and toggle “ON/OFF” graphs for each zone in the view.

For MAW, Multi-zone Workstation with compartments, the button will contain two values wherein two separate temperature curves will be shown.



Figure 22.9 Compartment with two temperature values

A zoom function is available by touching the screen and swiping the finger left over the area that should be zoomed.

Pressing the “Reset” button will jump back to full view.

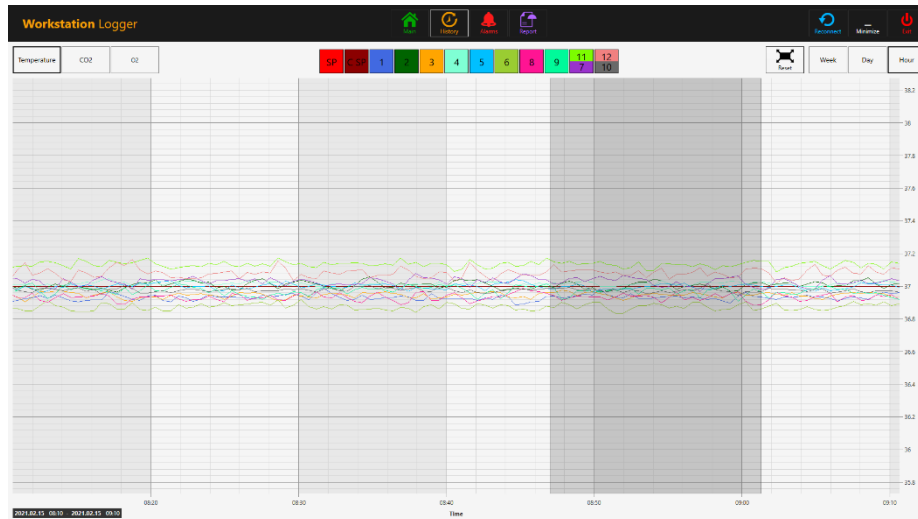


Figure 22.10 The zoom-in graph view

If there are data accumulated, it is possible to shift between a “Week”, “Day” and “Hour” view.

Pressing the CO₂ button will shift from the temperature data view to the CO₂ gas data view. In MAW, Multi-zone ART Workstation models without a built-in gas mixer, the user can only see the flow and pressure's historical CO₂ data.

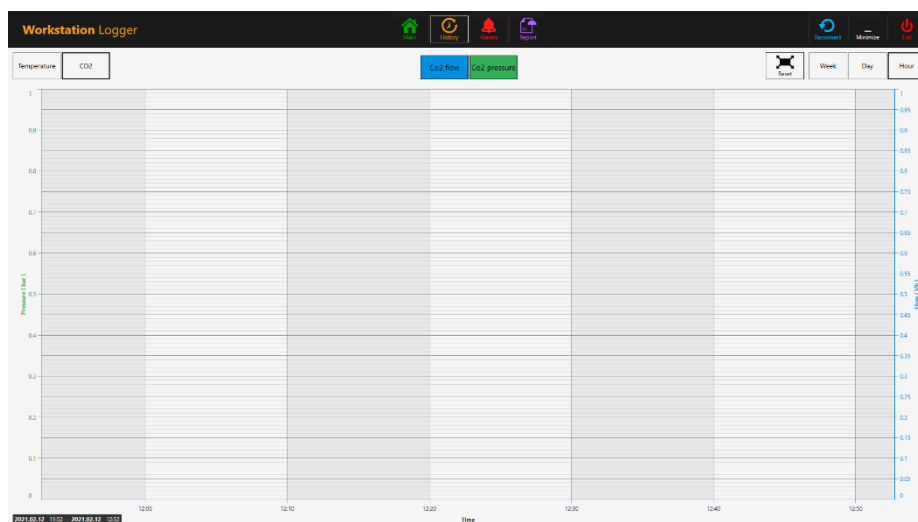


Figure 22.11 The “History” CO₂ data view

In MAW, Multi-zone ART Workstation models with a built-in gas mixer, the user can see the historical data of CO₂ gas concentration setpoint, concentration, flow and pressure.

Pressing the O₂ button will shift from the CO₂ gas data view to the O₂ gas data view. This function is only available in MAW, Multi-zone ART Workstation models with a built-in gas mixer.

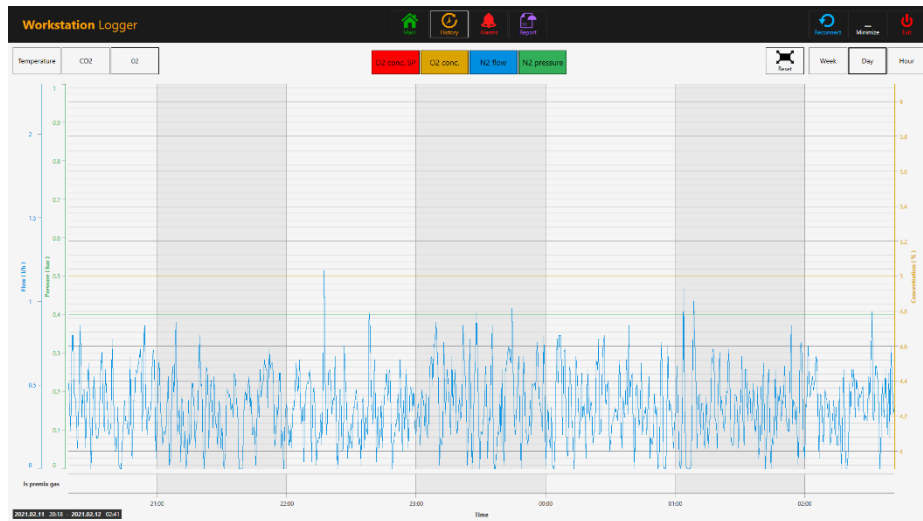


Figure 22.12 The “History” O₂ data view

The user can see historical data of O₂ gas concentration setpoint, concentration, N₂ gas flow and pressure.

The “Alarm” button will bring up the graphical alarm view. Alarm conditions for the parameters are shown as red on the timeline, thus making easy identification possible.

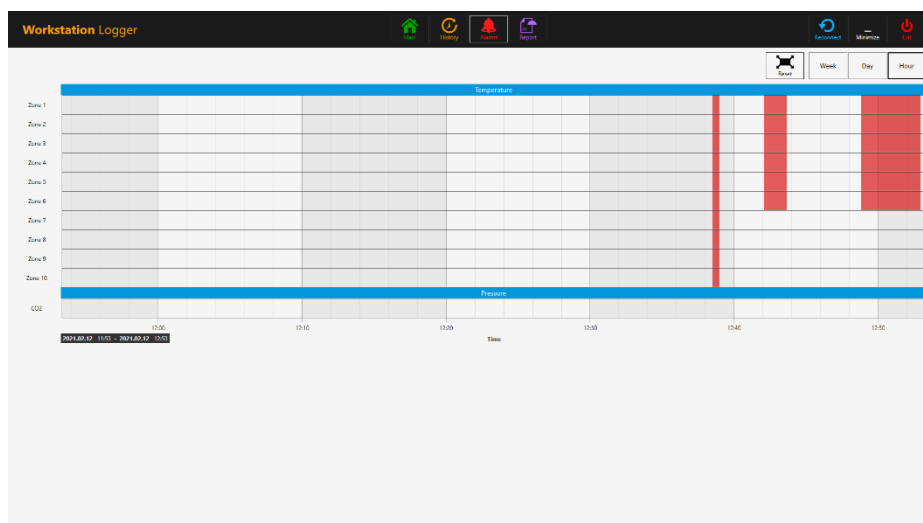


Figure 22.13 The graphical “Alarm” view (without a gas mixer)

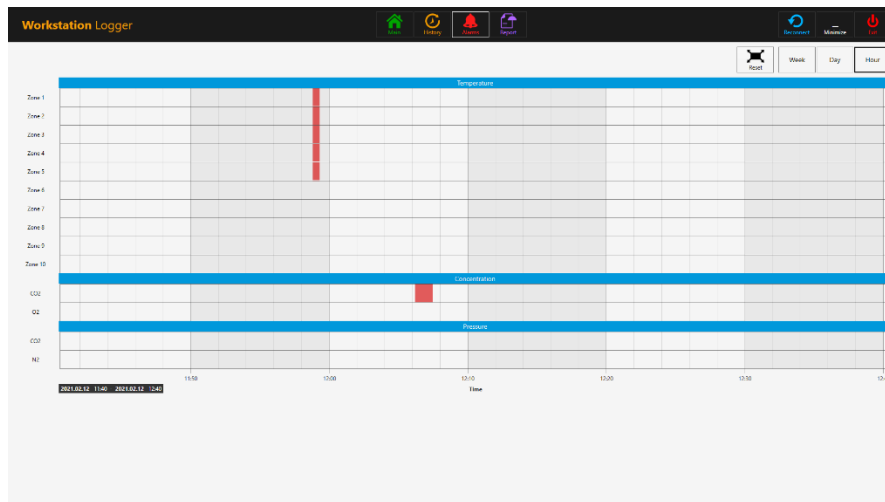


Figure 22.14 The graphical “Alarm” view (with a gas mixer)

The “Report” button will bring up the report mode. All the MAW, Multi-zone ART workstation's running parameters can easily be documented and printed as a report or exported in PDF, Excel or Word for convenient ISO quality management compliance.

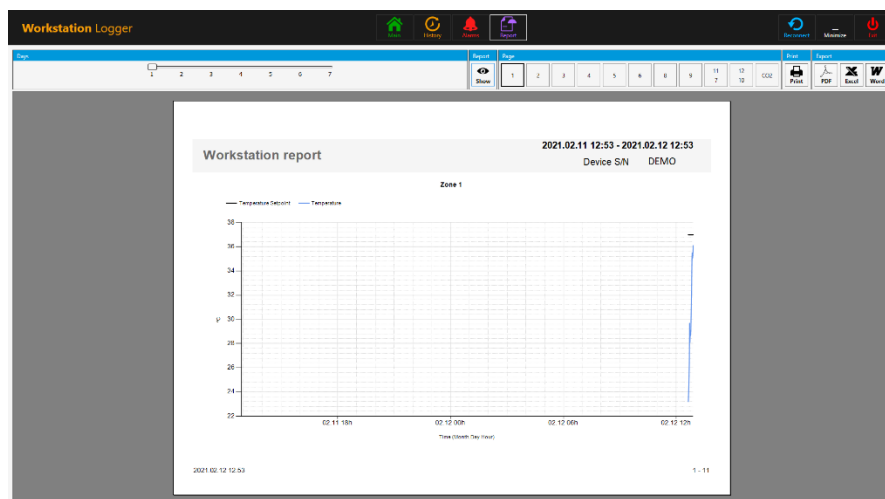


Figure 22.15 The “Report” mode view (without a gas mixer)

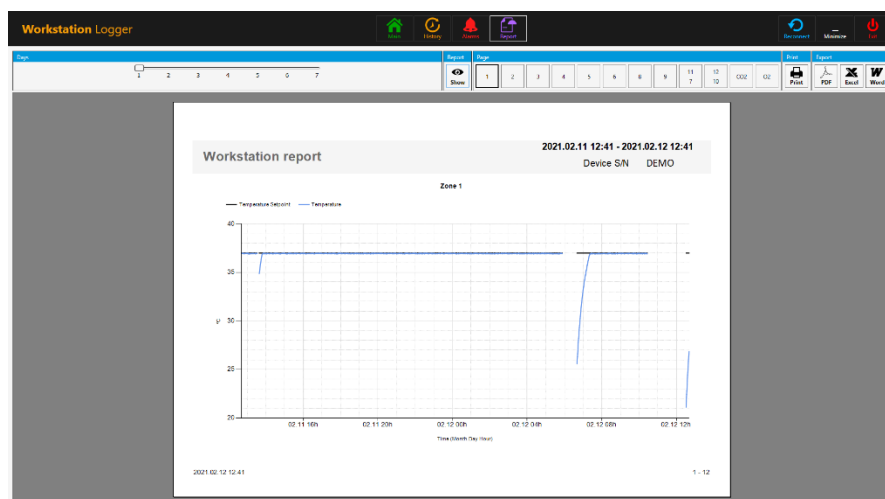



Figure 22.16 The “Report” mode view (with a gas mixer)


The 3 action buttons are located on the right-hand side:

- The “Reconnect” button allows the system to reconnect with the sensors (in case of data loss due to USB connection issues).
- The “Minimize” button toggles the full-screen format off for the Workstation Logger.
- The “Exit” button shuts down the Workstation Logger software.

 **No data will be stored and all safety surveillance functions will be operative if the Workstation Logger is shut down.**

The AIO PC can easily be used to display an image from any USB-type microscope camera.


A standard USB socket is located under the humidification system. It can be used to load the microscope camera drivers or other software onto the AIO PC. When the software is set up, the microscope camera can be connected to the USB socket and the image shown on the screen.

 **A force function is built into the Workstation Logger. When the microscope camera image uses the full screen on the AIO PC, the system will visually alert the user to any alarm conditions and make a rapid shift to the Workstation Logger's full view possible.**

23 Maintenance

The MAW, Multi-zone ART Workstation is designed to be easy to use, but the reliable and safe operation of this equipment is based on the following conditions:

1. Correct calibration of temperature and gas level, using high-precision equipment in the intervals prescribed based on clinical practice at the laboratory, where MAW, Multi-zone ART Workstation is used. The manufacturer recommends that the period between validation should be no longer than 14 days.
2. In-line HEPA filters must be replaced yearly during annual maintenance.
3. According to the clinical practice intervals, suitable cleaning is in the laboratory where MAW, Multi-zone ART Workstation is used. The manufacturer does not recommend periods longer than 14 days between cleaning.

 **It is essential to perform the inspection and service at the intervals indicated in the MAINTENANCE manual. Failure to do so can have serious adverse outcomes, causing the unit to stop performing as expected and cause damage to samples, patients or users.**



Warning Warranty is considered to be void if service and maintenance are not followed.



Warning Warranty is considered void if service and maintenance procedures are done not by trained and authorized personnel.

24 Emergency Procedures

Total loss of power to or on the unit:

- Remove all the samples and place them in an alternative or backup device that is not affected by the problem
- The MAW, Multi-zone ART Workstation will lose its temperature below a safe level in around 5 minutes
- The CO₂ concentration will remain within 1% of the setpoint for 30 minutes if the lids remain closed

If a single temperature alarm goes off:

- Remove all the samples and place them in an alternative or backup device that is not affected by the problem
- The MAW, Multi-zone ART Workstation will lose its temperature below a safe level in around 5 minutes
- Remove the samples from the affected zone. They can be relocated to the other zones. Each zone is separate so that the other zones will stay safe

If multiple temperature alarms go off:

- Remove the samples from the affected zones. They can be relocated to either of the other zones. Each zone is separate so that the others will stay safe

If the CO₂ pressure alarm goes off:

- Inspect the external gas supply and the gas supply lines. If the problem is external and not readily amendable, it usually will not be necessary to perform any emergency procedures other than stop using the humidification system

25 User Troubleshooting

Table 25.1 Heating system

Symptom	Cause	Action
No heating, the display is off	The unit is switched off at the back or not connected to the power	Switch the device on or connect the power
No heating	The alarm is on	The temperature is more than 0.5 °C off the set temperature
	The setpoint for temperature is wrong	Check the desired temperature setpoint
Uneven heating	System not calibrated	Calibrate each zone according to the user manual, using a high precision thermometer

Table 25.2 CO₂ gas regulator

Symptom	Cause	Action
"CO ₂ P" is shown on the display	No/wrong CO ₂ gas pressure to the system	Check CO ₂ gas supply; make sure that pressure is kept stable between 0.4 - 0.6 bar (5.80 – 8.70 PSI)

Table 25.3 Data Logger

Symptom	Cause	Action
No data is sent to PC	System not powered	Check mains
	The system is on standby or switched off	Switch the system on
	The data cable between Incubator and PC not correctly attached	Check connection. Use only the cable supplied with the unit
	Data logger software/USB driver not correctly installed	Please refer to the software installation guide

Table 25.4 Display

Symptom	Cause	Action
Missing segment(s) in display	Failure in the PCB	Contact your Esco Medical Distributor to replace the PCB

Table 25.5 Keyboard

Symptom	Cause	Action
The absent or erratic function of keys	Failure in the keys	Contact your Esco Medical Distributor to replace the keys

26 Specifications

Table 26.1 MAW, Multi-zone ART Workstation general specifications

Technical specifications	MAW-4D	MAW-6D MONO	MAW-6D DUAL	MAW-6D MP
Work area dimensions (WxDxH)	1260 x 500 x 710 mm	1870 x 500 x 710 mm		1870 x 490 x 780 mm
External dimensions without support stand (WxDxH)	1340 x 640 x 1300 mm	1950 x 640 x 1300 mm		1950 x 647 x 1360 mm
External dimension with “B” type support stand (WxDxH)	1340 x 640 x 2160 mm	1950 x 640 x 2160 mm		1950 x 647 x 2220 mm
Laminar airflow velocity	Average of 0,21 m/s or 41 fpm (± 20%)			
Filter efficiency	>99.999% for particle size between 0.1 to 0.3 microns per IEST-RP-CC001.3 / H14 per EN 1822			
Noise level (per NSF 49)	47 dBA	52 dBA		
Per-filter	Disposable and non-washable polyester fibers with 85% arrestance, EU3 rated			
Heating system	Smart power injection electrical heating, (9+1) zones		Smart power injection electrical heating, 2 x (9+1) zones	Smart power injection electrical heating, (9+1) zones
Temperature accuracy	± 0.2 °C			
Temperature uniformity	± 0.2 °C			
Included advanced features	<ul style="list-style-type: none">• Integrated humidification system HS-1• Surveillance system with data logger• AIO PC• Heated glass stage• Transmitted light source SC-1 (with bulb)• 5 x PT1000 validation ports		<ul style="list-style-type: none">• Dual Integrated humidification system HS-1• Surveillance system with data logger• AIO PC• 2 x Heated glass stage• 2 x Transmitted light source SC-1 (with bulb)• 10 x PT1000 validation ports	<ul style="list-style-type: none">• Dual Integrated humidification system HS-1• Surveillance system with data logger• AIO PC• Heated glass stage• Transmitted light source SC-1 (with bulb)• 5 x PT1000 validation ports
Included accessories	<ul style="list-style-type: none">• 1 x water bottle for HS-1, including tubing• 1 x sample carry tray• 1 x humidified gas plastic cover		<ul style="list-style-type: none">• 2 x water bottle for HS-1, including tubing• 2 x sample carry tray• 2 x humidified gas plastic cover	<ul style="list-style-type: none">• 1 x water bottle for HS-1, including tubing• 1 x sample carry tray• 1 x humidified gas plastic cover
Microscope provision	Provision for 1 microscope		Provision for 2 microscopes	Provision for 1 microscope and 1 inverted microscope

Table 26.2 MAW, Multi-zone ART Workstation with MIRI® compartments general specifications

Technical specifications	MAW-4D MC	MAW-6D MONO-MC	MAW-6D DUAL-MC	MAW-6D MP-MC
Work area dimensions (WxDxH)	1260 x 500 x 710 mm	1870 x 500 x 710 mm		1870 x 490 x 780 mm
External dimensions without support stand (WxDxH)	1340 x 640 x 1300 mm	1950 x 640 x 1300 mm		1950 x 647 x 1360 mm
External dimension with “B” type support stand (WxDxH)	1340 x 640 x 2160 mm	1950 x 640 x 2160 mm		1950 x 647 x 2220 mm
Laminar airflow velocity	Average of 0,21 m/s or 41 fpm (± 20%)			
Filter efficiency	>99.999% for particle size between 0.1 to 0.3 microns per IEST-RP-CC001.3 / H14 per EN 1822			
Noise level (As per IEST)	47 dBA	52 dBA		
Per-filter	Disposable and non-washable polyester fibers with 85% arrestance, EU3 rated			
Heating system	Smart power injection electrical heating, (7+1) zones		Smart power injection electrical heating, 2 x (7+1) zones	Smart power injection electrical heating, (7+1) zones
Number of MIRI® compartments	2		3	2
Temperature accuracy	± 0.2 °C			
Temperature uniformity	± 0.2 °C			
Included advanced features	<ul style="list-style-type: none">• Integrated humidification system HS-1• Surveillance system with data logger• AIO PC• Heated glass stage• Transmitted light source SC-1 (with bulb)• 5 x PT1000 validation ports		<ul style="list-style-type: none">• Dual Integrated humidification system HS-1• Surveillance system with data logger• AIO PC• 2 x Heated glass stage• 2 x Transmitted light source SC-1 (with bulb)• 10 x PT1000 validation ports	<ul style="list-style-type: none">• Dual Integrated humidification system HS-1• Surveillance system with data logger• AIO PC• Heated glass stage• Transmitted light source SC-1 (with bulb)• 5 x PT1000 validation ports
Included accessories	<ul style="list-style-type: none">• 1 x water bottle for HS-1, including tubing• 2 x sample carry tray• 1 x humidified gas plastic cover		<ul style="list-style-type: none">• 2 x water bottle for HS-1, including tubing• 3 x sample carry tray• 2 x humidified gas plastic cover	<ul style="list-style-type: none">• 1 x water bottle for HS-1, including tubing• 2 x sample carry tray• 1 x humidified gas plastic cover
Microscope provision	Provision for 1 microscope		Provision for 2 microscopes	Provision for 1 microscope and 1 inverted microscope

27 Electromagnetic compatibility

Table 27.1 Electromagnetic emissions

Guidance and manufacturer's declaration – electromagnetic emissions		
The MAW, Multi-zone ART Workstation is intended for use in the electromagnetic environment specified below. The customer or the MAW, Multi-zone ART Workstation user, should ensure that it is used in such an environment.		
Emissions test	Compliance	Electromagnetic environment – guidance
RF emissions CISPR 11	Group 1	The MAW, Multi-zone ART Workstation does not use RF energy. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class A	The MAW, Multi-zone ART Workstation is suitable for use in a hospital environment.
Harmonic emissions IEC 61000-3-2	Class A	
Voltage fluctuations/ flicker emissions	Class A	It is not for domestic establishments.

Table 27.2 Electromagnetic immunity

Guidance and manufacturer's declaration – electromagnetic immunity			
The MAW, Multi-zone ART Workstation is intended for use in the electromagnetic environment specified below. The customer or the MAW, Multi-zone ART Workstation user, should ensure that it is used in such an environment.			
Immunity test	IEC 60601 Test level	Compliance level	Electromagnetic environment- guidance
Electrostatic discharge (ESD) IEC 61000-4-2	±6 kV contact ±8 kV air	±6 kV contact ±8 kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst IEC 61000-4-4	±2 kV for power supply lines ±1 kV for input/ output lines		
Surge IEC 61000-4-5	±1kV differential mode ±2kV common mode		
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	<5 % 100V (>95% dip in 100V) for 0.5 cycle 40% 100V (60% dip in 100V) for 5 cycles 70% 100V (30% dip in 100V) for 25 cycles) dip in 100V) for 5 sec		
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3 A/m	Performance A	Power frequency magnetic fields should be at levels characteristic of a specific location in a typical commercial or hospital environment.

Guidance and manufacturer's declaration – electromagnetic immunity

The MAW, Multi-zone ART Workstation is intended for use in the electromagnetic environment specified below. The customer or the MAW, Multi-zone ART Workstation user, should ensure that it is used in such an environment.

Immunity test	IEC 60601 Test level	Compliance level	Electromagnetic environment- guidance
<p>Conducted RF IEC 61000-4-6</p> <p>Radiated RF IEC 61000-4-3</p>	<p>10 Vrms 150kHz to 80 MHz in ISM bands</p> <p>3V/m 80 MHz to 2.5 GHz</p>	<p>3 V/m from 80MHz to 2.5 GHz</p>	<p>Portable and mobile RF communications equipment should be used no closer to any part of the MAW, Multi-zone ART Workstation including cables, than the recommended separation distance calculated from the equation applicable to the transmitter's frequency.</p> <p>Recommended separation distance</p> <p>$d=0.35 P$</p> <p>$d=0.35 P$ 80MHz to 800 MHz $d=0.7 P$ 800MHz to 2.5 GHz P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer, d is the recommended separation distance in meters (m).</p> <p>As determined by an electromagnetic site survey, field strengths from fixed RF transmitters should be less than the compliance level in each frequency range.</p> <p>Interference may occur near equipment marked with.</p>

Table 27.3 Recommended separation distances

Recommended separation distances between portable and mobile RF communication equipment and the MAW, Multi-zone ART Workstation			
The MAW, Multi-zone ART Workstation is intended for use in the electromagnetic environment in which radiated RF disturbances are controlled. The customer or the MAW, a Multi-zone ART Workstation user, can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the MAW, Multi-zone ART Workstation as recommended below according to the maximum output power of the communications equipment.			
The rated maximum output power of the transmitter W	Separation distance according to the frequency of the transmitter (m)		
	150 kHz to 80 MHz $d=1.2\sqrt{P}$	80 MHz to 800 MHz $d=1.2\sqrt{P}$	800 MHz to 2.5 GHz $d=2.3\sqrt{P}$
0.01	0.1 m	0.1 m	0.2 m
0.1	0.4 m	0.4 m	0.7 m
1	1.2 m	1.2 m	2.3 m
10	3.7 m	3.7 m	7.4 m
100	11.7 m	11.7 m	23.3 m
For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (w) according to the transmitter manufacturer.			
NOTE 1: At 80 MHz and 800 MHz, the higher frequency range's separation distance applies.			
NOTE 2: These guidelines may not apply in all situations.			

Medical devices may be affected by cellular telephones and other personal or household devices not intended for medical facilities. It is recommended that all equipment used near the MAW, Multi-zone ART workstation product comply with the medical electromagnetic compatibility standard and to check before use that no interference is evident or possible. If interference is suspected or possible, switching off the offending device is the usual solution required in aircraft and medical facilities.

According to the EMC information, medical electrical equipment needs special precautions regarding EMC and needs to be installed and put into service. Portable and mobile RF communications equipment can affect medical electrical equipment.