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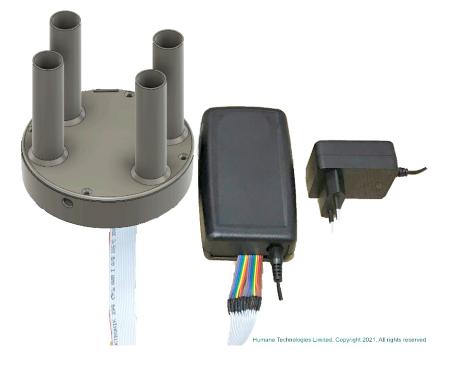
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# MicrobeMeter **HighTemperature**

**Operating Manual** 

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#### **SAFETY**

- Read this manual carefully before using this device.
- The instrument described in this manual is designed to be operated by appropriately trained personnel in microbiology laboratory practices where there is exposure to microorganisms. This device must be used in a suitably equipped laboratory under supervision of qualified or certified biohazard safety technicians. Pay particular attention to the biosafety level & appropriate containment level of your laboratory.
- References and consultation should always be made of the safety data sheets for intended use of microorganisms and the local manuals for the management and operation of microbiological containment especially the biosafety levels for the intended use of microorganisms. Always consult your Lead Laboratory Safety Advisor or Head of Health & Safety or equivalent position before using this device and before handling any microorganisms or chemicals, reagents or other devices using in conjunction with this device. Read carefully your local directives, rules and advisory notes for your organisation where handling of dangerous pathogens is concerned.
- For the correct and safe use of this instrument, it is essential that operators follow generally accepted microbiology and biohazard safe procedures in addition to the safety precautions set out in this manual and follow your organisations rules and regulations as well as following your local laws.
- Other than for those items defined in the maintenance procedures herein there are no user serviceable items in this instrument. Removal of the device covers and any attempt to adjust or service by unqualified personnel will invalidate the warranty and may incur additional charges for repair. Any attempt to open or tamper with the device and its electronic components is dangerous and could cause biohazardous materials to spill or cause infection and contamination and cause fire or create a hazard.

Continued

#### **SAFETY (CONTINUED)**

**WARNINGS** 

- References should always be made to the Health and Safety data supplied with any chemicals used. Generally accepted laboratory procedures for safe handling of chemicals should be employed.
- If it is suspected that safety protection has been impaired in any way, the instrument must be made inoperative and secured against any intended operation. The fault condition should immediately be reported to the appropriate servicing authority.
- Always check test tubes for safety to avoid contamination & avoid hazard & infection.
- Your country of use may determine legal standards for the safe handling and containment of microorganisms. Always consult the rules, regulations and laws of your jurisdiction for the safe handling and containment of microorganisms.
- The measurement part of this device with 4 measurement ports is designed for a maximum operating temperature of 85°C and will be extremely hot when removed from your heated incubator. There is a risk of burns and heat related injury. Heat protective gloves must be worn when handling the device when hot.
- Always wear appropriate personal protective equipment (PPE) when handling microorganisms as determined by your local organisation's rules and regulations to prevent infecting yourself or others.
- Always follow your organisation's sterilisation, cleaning and decontamination rules, guidelines and regulations. If in doubt consult your Lead Laboratory Safety Advisor or Head of Health & Safety or the equivalent position in your organisation.
- When using this device including alongside or with any other equipment, the user is responsible for their own safety and security and observing that equipment's manuals.
- Never exceed the MicrobeMeter specifications set out in this manual. Exceeding the limits specified could damage the device, is dangerous to users, is hazardous and could lead to contamination and infection.

## 

Read these warnings carefully before using this device. They are not exhaustive and are not intended to replace or substitute rules, guidelines, training, local laws, guidance of your organisation's Safety Officer or advice you have been given but intended to supplement.

- The handling of microorganisms and biohazard materials can cause infection, disease or even lead to death. Some microorganisms are dangerous pathogens. Infection by microorganisms can lead to significant personal harm to the user and those around them, including the potential to cause significant injury and death.
- Strictly following and practicing rules provided in safety data sheets, your local directives, regulations and advice published by your organisation's health and safety department or equivalent, especially when handling dangerous pathogens and their containment and biosafety practices, is critical to your safety.
- Use of other equipment and devices must strictly follow the management and operation of microbiological containment equipment manuals and manufacturer's operating manuals of biosafety equipment suitable for the intended use of microorganisms. Always consult your Lead Laboratory Safety Advisor or Head of Health & Safety before using or handling any microorganisms with other equipment.

Extreme care should be exercised when using this instrument with any microorganism.

READ THE WARNINGS THAT FOLLOW CAREFULLY

#### **WARNINGS (CONTINUED)**

#### 

- This device is an electrical device and there is a danger of electrocution if this device is tampered with, opened or broken.
- Do not exceed the electrical limitations or specifications.
- Do not use electronic equipment in the presence of flammable gas or vapour, as this could cause explosion or fire.
- Keep out of reach of children, failure to observe this could cause injury, choking and possibly lead to death.
- Do not drop the device or it will damage it, it could break the test tubes (if fitted) and lead to contamination and infection and cause a hazard. Do not use the device, discard it safely in accordance with waste rules.
- If the device breaks open through damage, disconnect the device from the power outlet and remove the battery where fitted. Do not use the device, discard it safely in accordance with waste rules.
- Do not disassemble the device. Touching the device internal parts could damage the device, cause injury or a hazard or electrocution.
- In the event of malfunction or if the device fails it should be repaired by Humane Technologies Limited only.
- Care should be taken with glass test tubes that can break & cause a sharps hazard, injury and infection.
- Only Hungate or Balch type test tubes of 18mm diameter should be used in this device.
- Hungate or Balch type test tubes are not consistently dimensionally accurate, it is therefore possible for a test tube to become stuck in a measurement port.
- It is possible for a test tube to become stuck in a measurement port. To avoid a test tube from becoming stuck trial a sample tube set before use to ensure it inserts, travels and is easily removed from the measurement port.
- If a test tube becomes stuck please consult your Lead Laboratory Safety Advisor or Head of Health & Safety or equivalent position before taking any action. Contact Humane Technologies Limited.
- Attempting to forcibly removing a stuck test tube could lead to breakage, broken glass, sharps risks, contamination, infection or injury. Never use bare hands.

Continued

#### **WARNINGS (CONTINUED)**

- Do not exceed the device specifications and application parameters, doing so could result in malfunction, will invalidate any warranty and could cause injury or hazard.
- Observe care and precaution when handling batteries and power adaptors
  - Keep the power adaptor dry, dust free and away from flammable gas or vapour.
  - o Do not short-circuit the power adaptor terminals.
  - Only use a power adaptor designed for use with this device and with your country's supply.
  - Do not damage the power adaptor or its cable and do not open the power adaptor.
  - Check the power adaptor cable's integrity regularly and before each use.
  - Do not subject the power adaptor cable to excessive forces, pulling, tugging or bending or crushing.
  - Do not subject the data ribbon cable to excessive forces, pulling, tugging or bending or crushing.
  - o Do not subject the power adaptor cable to fire or heat.
  - Do not handle the power adaptor with wet hands or wet gloves.
  - Do not short-circuit or disassemble the power adaptor or the device itself.
  - Do not expose the power adaptor to excessive heat and do not expose it to flame.
  - $\circ\quad$  Do not immerse the power adaptor in water or liquid.
  - o Replace the cover when fitting the device to a shaker.
  - Do not damage the data ribbon cable or its electronics unit or the measurement units.
  - The measurement part of this device with 4 measurement ports is designed for a maximum operating temperature of 85°C exceeding this could lead to damage to the device and your incubator.

Continued

#### **WARNINGS (CONTINUED)**

- The measurement unit part of this device with 4 measurement ports is designed for a maximum operating temperature of 85°C and will be extremely hot when removed from your heated incubator. There is a risk of burns and heat related injury. Heat protective gloves must be worn when handling the device when hot.
- Only use the device within the temperature parameters stated and do not exceed them with either higher or lower temperatures than stated.

THIS DEVICE IS NOT A MEDICAL DEVICE, IT IS NOT CERTIFIED AS & NOT QUALIFIED AS A MEDICAL DEVICE & IT SHOULD NOT BE APPLIED DIRECTLY OR INDIRECTLY TO TREAT HUMANS.

THIS DEVICE IS NOT A VETERINARY DEVICE, IT IS NOT CERTIFIED AS & NOT QUALIFIED AS A VETERINARY DEVICE & IT SHOULD NOT BE APPLIED DIRECTLY OR INDIRECTLY TO TREAT ANIMALS.

FAILURE TO OBSERVE THESE PRECAUTIONS AND WARNINGS AND FAILURE TO TAKE OTHER RESPONSIBLE AND REASONABLE ACTIONS TO AVOID HAZARD, MAINTAIN HEALTH AND SAFETY COULD CAUSE EFFECTS SUCH AS, BUT NOT LIMITED TO: DAMAGE, OVERHEATING, FIRE, INJURY, ELECTRIC SHOCK, CONTAMINATION, BIOHAZARD, INFECTION, INJURY, DEATH, BREACH OF THE LAW, FINANCIAL LOSS.

It is the user's responsibility to exercise caution, to consult their local rules and guidelines and take any other responsible and reasonable actions to avoid any risk, hazard or danger.

Users under the age of 21 years must be supervised in the use of this device and it is the laboratory manager's responsibility to ensure safety practices are fully observed in its use.

#### **DISCLAIMER**

This instrument (including the battery and any accessories) must be used in accordance with: our terms of supply of products & services, this operating manual & the battery manual, in particular the safety instructions and guidelines stated in this documentation & your local health & safety rules, guidelines & the laws of your particular jurisdiction.

The user or laboratory manager or safety officer is fully responsible for safety and security when using this device.

Humane Technologies Limited shall not & cannot be held liable & cannot & will not accept any responsibility for any loss or damage howsoever caused from any failure when using this instrument.

#### **NOTICES**

No part of this operating manual may be copied or reproduced in whole or in part.

Humane Technologies Limited reserves the right to change the design & specification of the hardware & software without notice. Latest versions of this manual may be obtained from Humane Technologies Limited.

Effort has been made to ensure this manual is accurate and complete. Please bring any errors or omissions to the attention of Humane Technologies Limited by contacting the company via their website contact details at: www.humanetechnologies.co.uk.

Biohazard and decontamination procedures should be followed in accordance with your organisation's rules.

Do not dispose of the battery or this device in household waste.

This device and battery are designated for waste collection separately at appropriate collection points and must be observed. Observe your organisations biohazard practices and consult your Lead Laboratory Safety Advisor or Head of Health & Safety or Waste Disposal Officer or equivalent position before disposal.

Note this device may become a biohazard and must be treated in accordance with your organisation's rules.



#### **Aerobes, Anaerobes and Thermophiles**

For measuring aerobic or anaerobic cell growth dynamics. Also for growing thermophiles at up to 85°C.



#### **Fully Automated and Programmable**

Fully programmable automated measurements. Set the measurement frequency using the data acquisitions. Automation allows efficient and remote working.



#### **Wireless Data Capture**

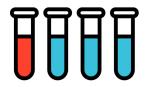
Publication-ready data.

Data is transmitted to any computer
(Windows or Mac) in real-time at
programmable intervals as low as every six
seconds. Automated continuous data
capture for many days, even when you're
out of the lab'!



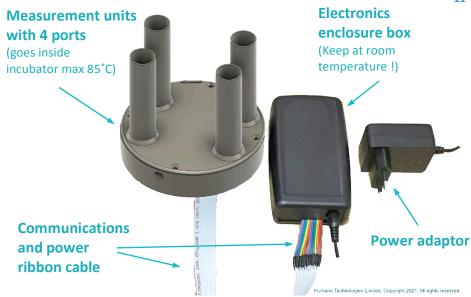
#### **Environment Control**

Can be used in temperature-controlled incubators, shakers or containment chambers. It can even be used in the field. Low bench-top footprint.



#### **Multi-experiment Design**

Four ports, with low port-to-port variability. Reproducible and repeatable results. Uses standard Hungate tubes. Syringe sampling capable.



### **GENERAL INFORMATION**

MicrobeMeter HighT is an automated microbial growth measurement photometer. It collects data making  $OD_{600}$  turbidity measurements, and takes advantage of the correlation between turbidity and microbial growth. MicrobeMeter HighT is innovative because it:

- Is automated & takes continuous, long-term turbidity measurements of microbial growth,
- Is programmable with data capture intervals down to 6 seconds frequency,
- Wirelessly transmits publication ready data directly to a computer or a phone,
- Cultures thermophilic anaerobic and / or aerobic organisms for long periods at up to 85°C,
- Measures growth of fast and slow growing microbes,
- Has a low footprint enabling microbial growth measurement in space limited containment conditions.

#### **INSTRUMENT SPECIFICATIONS**

MicrobeMeter HighT specifications are as follows:

Dimensions (mm):

Height: 165.3
 Diameter: 126.2
 Weight: 660 g

Power source:
9V, 670mA

Maximum current consumption: 200mA

Number of measurement ports: 4

Measurement wavelength: 601nm dominant

Light source:
LED

Light sensor:
Silicon photodiode

Signal amplifier gain: 10.2M

Bluetooth module:
Bluetooth 4.2

On board temperature sensor: Yes

Data acquisition:
Dedicated user interface

software

Each MicrobeMeter has a unique serial number.

Your MicrobeMeter HighT arrived with a factory test data sheet for the serial number of your device, which assures you of its quality and performance. It provides you with performance data for each measurement port.

#### PRODUCT COMPLIANCE AND CERTIFICATIONS

MicrobeMeter HighT complies with the CE marking regulations and meets the electromagnetic compatibility standards set by the EU.

All components and solder alloys used in this product comply with the RoHS Directive.

MicrobeMeter HighT contains a Bluetooth module with:

FCC ID: A8TBM71S2

Frequency Range: 2402.0 - 2480.0 MHz

Output Watts: 0.0012W

MicrobeMeters are designed, manufactured & assembled in the UK.



#### **INSTRUMENT OPERATING CONDITIONS**

Operating conditions for MicrobeMeter HighT are as follows:

Optimal operating temperature range: 80 - 85°C maximum

Maximum operation temperature: 85°C

Minimum operation temperature: 70°C

Maximum shaking speed (when used in a shaking incubator): 300rpm (revolutions per minute)

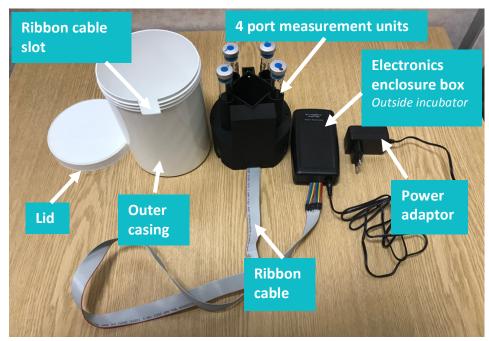
Maximum shaking amplitude: 26mm (orbital)

The device must be pre-heated before use, this is to temperature equilibrate the electronics and measurement units before data capture.

#### **INSTRUMENT PARTS AND SETUP**

MicrobeMeter HighT is composed of the following parts:

- Device chassis (black) with four measurement ports
- Communications and power ribbon cable
- A white plastic outer casing container and its lid
- Power adaptor
- Electronics enclosure box for data recording and the communications board with a long data ribbon communications and power cables
- Installation software
- Users should select suitable 18mm dia. Hungate or Blach type test tubes that insert and remove freely from the measurement ports without sticking/resistance.



Actual colour & shape of MicrobeMeter HighT may be different from image above.

#### **INSTRUMENT SETUP**

MicrobeMeter HighT comes with all parts ready to setup & use.

To operate the instrument:

- 1. The MicrobeMeter HighT measurement unit with 4 ports should be kept <u>inside</u> the heating incubator but its electronics enclosure box (see images) must be kept <u>outside</u> the incubator at room temperature.
- 2. **IMPORTANT** !: The 4 port measurement unit (only) must be pre-heated inside the heated incubator for at least 1 hour and 30 minutes prior to use. This allows it to heat-soak / pre-heat and therefore equilibrate at operating temperature (i.e. from 70°C to 85°C maximum) prior to measurement. Expect inaccurate data without heat-soaking/pre-heating the measurement unit.
- 3. Once the MicrobeMeter HighT is equilibrated and heat-soaked at the desired incubation temperature, the user can turn on the device by powering its Electronics enclosure box using the power adapter provided.
- 4. Refer to the Measurement Unit detail images on Page 19 for each port orientation and numbering.
- 5. The electronics enclosure box must always be kept at room temperature and must **NOT** be kept inside the heated incubator. **Only** the measurement unit with 4 ports can be used inside the heated incubator.

⚠ WARNING: Make sure that the ribbon cable connecting the MicrobeMeter HighT and its Electronics enclosure box passes between the incubator door without bending or curling or crushing or tugging or pulling.

#### **INSTRUMENT SETUP (CONTINUED)**

- ⚠ WARNING MicrobeMeter HighT measurement unit is designed to operate within the white container outer casing, such as the one provided with the unit. Operation of the device without such outer enclosure is not advised and could cause spillage, contamination or infection.
- ⚠ WARNING Operating\_MicrobeMeter HighT measurement unit without the white container outer casing could cause damage to the device and its measurement units in a shaking incubator due to the shaking forces, cause contamination, injury and invalidate any warranty. Always use the device inside the white container outer casing when in a shaker.
- ⚠ **WARNING** When inserting the measurement unit into the white container and before closing the lid make sure the ribbon cable passes through the slot in the white container casing before closing the lid. Making sure the ribbon cable is not bending or curling or crushing or tugging or pulling.
- ⚠ WARNING

  Do not spill liquid or make liquid contact with the instrument. In case of liquid spillage, the instrument should be immediately disconnected from the power, stored it in a cool dry place and not used again. Contact Humane Technologies for repairing and servicing options.
- ⚠ **WARNING** Do not use the device with flammable gas or vapour, which could result in fire or explosion.

Continued

#### **INSTRUMENT SETUP (CONTINUED)**

- ⚠ **WARNING** The 4 port measurement unit of this device is designed to operate at a maximum temperature of 85°C. It will be extremely hot when removed from your heated incubator. There is a risk of burns and heat related injury. Heat protective gloves must be worn when handling the measurement unit when it is hot.
- ⚠ WARNING MicrobeMeter HighT 4 port measurement unit is designed for use with 18mm diameter Hungate or 'Balch-type' tubes and their manufacture is not made to consistent dimensional accuracy. It is possible for a test tube to become stuck in a measurement port. To avoid a test tube from becoming stuck trial a set of sample tubes before use to ensure they insert, travel and are easily removed from the measurement ports.
- ⚠ **WARNING** Do not cool the hot measurement unit suddenly which could result in damage, cracking or breaking the device due to rapid contraction. Allow the measurement unit to cool down slowly in a safe place.



#### **SOFTWARE SETUP**

MicrobeMeter High T operates through a simple user interface software that allows for data acquisition and communication.

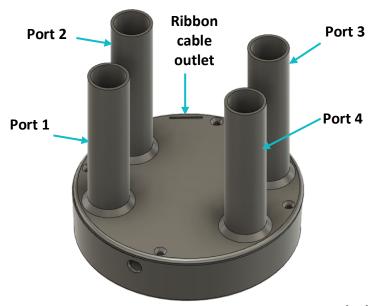
This software (file titled "MicrobeMeter\_Beta\_v1.exe" ) can be downloaded on the Humane Technologies Ltd. website; <a href="https://humanetechnologies.co.uk/shop-microbemeter/">https://humanetechnologies.co.uk/shop-microbemeter/</a>

The user interface software needs to be run on the computer that the user intends to use to communicate with the MicrobeMeter HighT. This software is currently only compatible with a Windows 10 computer.

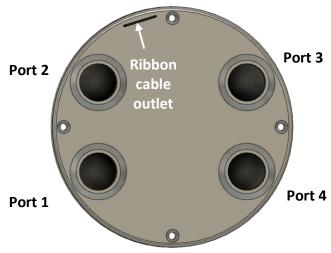
Prior to running the software, the user should have:

- MicrobeMeter High T with power adaptor connected
- A Windows computer running Windows 10 version 1803 or higher, and having Bluetooth 4.0 capability.
- <u>MARNING</u> Users should not use or install MicrobeMeter High T with any other software, other than the software provided by Humane Technologies Limited.
- ⚠ **WARNING** Do not operate MicrobeMeter High T with any other software other than software provided by Humane Technologies Limited could result in malfunction or damage the device and invalidate any warranty.
- ⚠ **WARNING** There is a risk that using and installing alternative software other than the software provided by Humane Technologies Limited could infect your systems with malware or a computer virus that could damage your systems and compromise your data.

#### MICROBEMETER HIGHT MEASUREMENT UNIT DETAIL



Measurement Unit side view



**Measurement Unit top view** 

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#### **OPERATING INSTRUCTIONS**

Continued

**OPERATING INSTRUCTIONS (CONTINUED)** 

To operate the MicrobeMeter High T, or multiple MicrobeMeter High Ts, they should be connected with a computer via the data acquisition and communications software (see software instructions).

To run an experiment, simply prepare the tubes containing desired samples (e.g. microbial cultures and a control blank) and follow these steps:

- 7. Download the program "MicrobeMeter\_Beta\_v1.exe" from the Humane Technologies website <a href="www.humanetechnologies.co.uk">www.humanetechnologies.co.uk</a> to your computer.
- 8. Turn on the MicrobeMeter HighT using the power adaptor provided.
- Place the MicrobeMeter HighT Electronics enclosure box within 1
  meter of your computer in close proximity (once the setup is
  finished, if needed, the MicrobeMeter HighT Electronics enclosure
  box can be moved further away from the computer for taking
  measurement).
- 10. Wait for 10 seconds for MicrobeMeter HighT to startup, and then run "MicrobeMeter\_Beta\_v1.exe" on your computer, by double clicking on it.
- 11. A command prompt should appear, indicating the software is searching for the MicrobeMeter Bluetooth signal.
- 12. Once the software finds a MicrobeMeter HighT, its device name will appear on the command line window. Each MicrobeMeter HighT comes with a unique device name in the format; "HTLMMHT#####", where ###### is a unique 6-digit identifier number.
- 13. Click on the command window and use the arrow keys to choose the device name of the MicrobeMeter HighT, to which you would like to connect. Press enter. The software now should connect to the MicrobeMeter HighT.

1. Move the MicrobeMeter HighT into a heated incubator and keep its Electronics enclosure outside the incubator.

- a. Make sure that the ribbon cable connecting the MicrobeMeter HighT and its Electronics enclosure passes smoothly between the incubator door without bending or curling.
- b. The 4 port measurement unit (only) must be pre-heated inside the heated incubator for at least 1 hour and 30 minutes before use for it to equilibrate with the operating temperature (i.e., from 70°C to 85°C max.) prior to using it for measurement. Expect erroneous data if the measurement unit is not pre-heated.
- 2. When the MicrobeMeter software asks the user to input an experiment name, enter an experiment name and press enter. Repeat the same for the file name. Then it will ask for the frequency of measurements. Enter the frequency in seconds (e.g. 6s, 10s, etc.) or in minutes (e.g. 1m, 60m, etc.) and press enter. Note that 6 seconds is the minimum/fastest measurement frequency possible on MicrobeMeter HighT.
- 3. Follow the on-screen instructions to carry out the "Blanking" procedure by placing the blank tube in each port when instructed.
- 4. Place the sample and blank tubes in four ports based on the onscreen instructions.
- 5. Data acquisition will now start. Note that data is both displayed on the screen and written on a data file with the same name as the user-entered experiment name.
- 6. Note that data is both displayed on the screen and written on a data file with the same name as the user-entered experiment name.

Continued

#### **OPERATING INSTRUCTIONS (CONTINUED)**

NOTE! Please note the port numbering when using the blank or control tube, see page 19 above.

NOTE!

MicrobeMeter HighT measurement ports are designed for 150mm tall glass test tubes with an outer diameter of 18mm (Hungate or 'Balch-type' tubes). While based on commercially available tube sizes, such "standard" tubes show within-batch dimensional variability in their outer diameter. It is possible for a test tube to become stuck in a measurement port. To avoid a test tube from becoming stuck trial sample tubes set before use to ensure they insert, travel and are easily removed from the measurement ports. Do not use tubes that have resistance to insertion or removal.

NOTE!

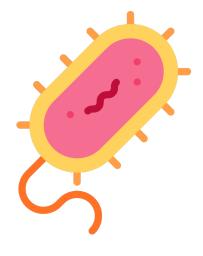
MicrobeMeter HighT should be operated with the white container lid fitted to avoid spillage, breakage and contamination.

NOTE!

The 4 port measurement unit (only) must be preheated inside the heated incubator for at least 1 hour and 30 minutes prior to use. This allows it to heatsoak/pre-heat and equilibrate the system at operating temperature (85°C maximum) prior to measurement. Expect inaccurate data without heat-soaking/preheating.

△WARNING The 4 port measurement unit of this device is designed to operate at a maximum temperature of 85°C. It will be extremely hot when removed from your heated incubator. There is a risk of burns and heat related injury. Heat protective gloves must be worn when handling the device when it is hot.

 $\triangle$ **WARNING** Forcibly removing a stuck test tube risks the glass breaking causing injury, infection & damaging the device. Consult Humane Technologies Limited.





#### **SOFTWARE - TURBIDITY CONVERSION**

MicrobeMeter output data files consist of raw light intensity values measured by the MicrobeMeter sensor circuit. These values need to be converted to turbidity values and temperature compensated using the Blank measurements from the Port 4. MicrobeMeter has an R script to do this calculation.

Download the conversion software: *TurbidityCalculator.R* calculator from our website <a href="www.humanetechnologies.co.uk">www.humanetechnologies.co.uk</a> along with the <a href="mailto:MicrobeMeter\_Data\_Processing.xls">MicrobeMeter\_Data\_Processing.xls</a> Excel file. These files are subject to our Terms for Downloading Digital Content.

Please follow these instructions for using this script:

- 1. Open and run the *TurbidityCalculator.R* script using R or R Studio software.2.
- 2. Type turbidityCalculator() on the console & press "enter".
- 3. Follow the on-screen instructions.
- 4. The output files should be stored in the same folder as you run the R script, but if R is configured differently, the output files may be stored at the home location of your computer.

Each step of the calculation is also explained using an example dataset in the associated *MicrobeMeter\_Data\_Processing.xls* Excel file for your reference. See table to the right.

**NOTE!** As the raw measurements between different spectrophotometers are not generally comparable due to the use of different optic systems, MicrobeMeter values cannot be directly compared to other spectrophotometer measurements.

#### **TURBIDITY VALUES**

| Time     | Temperature °C | Port_1 | Port_2 | Port_3 |
|----------|----------------|--------|--------|--------|
| 16.20.20 | 27.02          | 0.5701 | 0.5544 | 0.5607 |
| 16:39:28 | 37.92          | 0.5701 | 0.5541 | 0.5607 |
| 16:40:28 | 37.92          | 0.5701 | 0.5541 | 0.5640 |
| 16:41:28 | 37.92          | 0.5697 | 0.5536 | 0.5602 |
| 16:42:28 | 37.92          | 0.5701 | 0.5541 | 0.5640 |
| 16:43:28 | 37.92          | 0.5701 | 0.5541 | 0.5708 |
| 16:44:28 | 37.92          | 0.5760 | 0.5576 | 0.5703 |
| 16:45:28 | 37.92          | 0.5765 | 0.5622 | 0.5674 |

#### **DEVICE CLEANING**

MicrobeMeter contains plastic parts, sensitive electronic components, electric power supply & sensitive sensors. Note that not all surfaces are smooth & the device has internal & externals gaps and other areas of risk of harbouring microbes.

**△WARNING** It must not and cannot be autoclaved or irradiated.

For cleaning & sterilization consult your laboratory safety manager or equivalent position prior to cleaning.

Use cleaning procedures appropriate to the microbes you have used with the device & appropriate to electronic devices.

<u>MARNING</u> Disconnect the device from power/battery before cleaning. Remove the battery, if fitted, before cleaning.

#### **Suggested Cleaning**

Use isopropyl alcohol between 70-80%. Swab with a damp, but not a wet or soaked swab, all over the device. Leave the device to dry thoroughly before re-using. Paying attention to rough surfaces, gaps etc. Repeat if necessary.

<u>MARNING</u> Take care inside the measurement ports to not soak or introduce liquid or damage internal parts.

#### MAINTENANCE AND TROUBLESHOOTING

MicrobeMeter HighT is an innovative instrument that should not present any problems when used according to the guidelines provided in this manual. It is a tried and tested device by many worldwide researchers.

Please keep the following additional points in mind:

- MicrobeMeter HighT is designed for measuring OD<sub>600</sub> turbidity of a microbial suspension. Thus, for best results, the device should be used in a shaking incubator that can maintain growing cells in a suspended state (observe the operating limits stated above).
- When working with dense cultures or cultures forming clumps, inclining the device in a shaking incubator can provide better results for achieving better suspension. Ensure it is well secured in the shaker to avoid an accident.
- MicrobeMeter HighT is designed to work with microbial culture tubes conforming to the parameters stated. Use of the instrument with any other tubes is not advised. Users should also be aware that test tubes have within-batch dimensional variation of the tube diameters and some could get stuck in the measurement ports without sampling the best fitting tubes first.

**NOTE!** It is strongly advised that users pre-select test tubes that insert and remove freely from the measurement ports before use and set-aside or discard tubes that exhibit any resistance to insertion or removal.

- Outer diameter, 18mm
- Length, 150mm (by exception only, higher tubes could be used if the outer casing is not required but care should be taken to avoid a possible ejection of tube(s))

#### MAINTENANCE AND TROUBLESHOOTING

- If a test tube becomes stuck please consult your Lead Laboratory Safety Advisor or Head of Health & Safety or equivalent position or Humane Technologies Limited before taking any action.
- ⚠ WARNING: Attempting to forcibly remove a glass tube tuck in the measurement port could lead to glass breakage, sharps risks, contamination, infection and injury.
- MicrobeMeter HighT is designed for measuring turbidity of a microbial suspension. Thus, for best results, MicrobeMeter HighT should be used in a shaking incubator that can maintain growing cells in a suspended state. When working with dense cultures or cultures forming clumps, inclining MicrobeMeter HighT in a shaking incubator can provide better results for achieving better suspension.

**NOTE!** Take care when culturing aerobes that the volume of liquid in the tube does not make contact with the top of the tube when using a permeable membrane or a porous plug because the liquid/soaking effect will prevent efficient gaseous exchange.

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#### **FEEDBACK AND YOUR PUBLICATIONS**

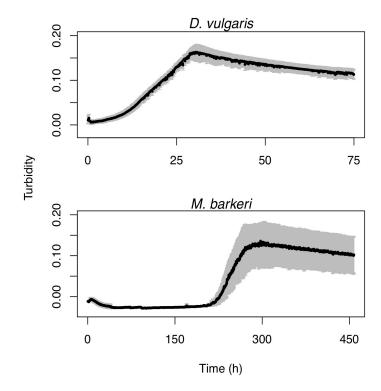
We designed all our MicrobeMeter devices for easy, efficient and effective microbiology experiments and research. Our solutions were born from our own laboratory experiences and we want to share our solutions with our fellow microbiology community.

We always want to improve. Your feedback however critical it may be, is an opportunity to ensure our products are relevant for the microbiology community.

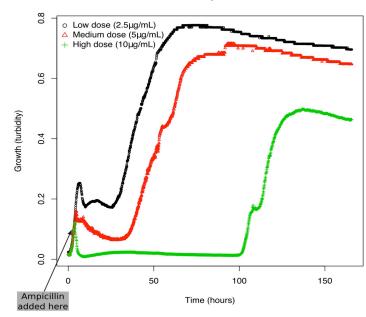
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30 31



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For thermophiles from 70°C to 85°C maximum.

Shaking incubator compatible.

Data direct to your computer wirelessly.



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For thermophiles from 25°C to 85°C maximum.

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