Trace2O

AquaSafe

WSL25 Plus

Water Safety Laboratory Instruction Manual

Contents

Section 1: Introduction

The AquaSafe® WSL25 Plus is a fully portable field laboratory for the detection of microbiological and physico-chemical water quality parameters.

The lab is housed in a waterproof carry case with and comprises the following:

- Integrated single chamber digital incubator complete with all accessories and consumables for carrying out 300 tests for Faecal and Total Coliforms.
- Comparator complete with accessories and consumables for 300 tests of Free & Total Chlorine.
- Pocket meter for pH
- Pocket meter for EC
- Turbidity Tube for turbidity testing in the range 5 to 500NTU
- Arsenic Economy test kit with consumables for 300 tests

Section 2: Kit Contents

Main Case Components

Item	Qty	Description
1	1	AquaSafe® Single Incubator
2	1	PetriLok® Cassette with cap and 25 Aluminium Petri Dishes
3	1	2 Part Turbidity Tube 5-500NTU
4	1	5 Metre Sampling Cable with Carabiner
5	1	12V 4A Lead Acid Charger/Power Supply
6	1	IEC Mains Cable - UK
6	1	UK to EU Adapter
7	1	Vehicle Charging Cable
8	1	Multi-Purpose Screwdriver
9	1	Digital Thermometer
10	1	Silicone grease
11	1	Calibration Pack
12	6	Membrane Lauryl Sulphate Broth Sachet
13	6	Dechlorination Tablet Bags (Whirl-Pak)
14	1	Comparator Chlorine Disc
14	1	Comparator Ammonia Disc
14	1	Comparator Nitrate Disc
14	1	Comparator Nitrite Disc
15	4	Comparator Cells
16	1	Nitrate Test Tube
17	1	Test Tube Brush
18	1	HydroLite® HL101 pH Meter
19	1	HydroLite® HL102 EC Meter

Tray Components

Item	Qty	Description
a	4	Sterilised Water for Membrane Lauryl Sulphate Broth Preparation
b	2	Sterile Absorbent Pads (100 Pack)
c	1	Pad Dispenser
d	1	Forceps
e	1	5ml Sterile syringe
f	1	Comparator
g	1	Vacuum Pump
h	1	Membrane Filtration Unit including, waste beaker, sample beaker, measuring funnel, sintered glass disk & 1 silicone gasket
i	1	Vacuum Tube
j	1	Eyeglass
k	1	30ml Dropper Bottle for Methanol

Separate Box

Qty	Description
3	Sterile Membrane Filters (100 Pack)
1	Sterile Absorbent Pads (100 Pack)
3	Nitrite Reagents (100 Pack)
3	Chlorine Free/Total Reagents (100 Pack)
3	Ammonia Reagents (100 Pack)
3	Nitrate Reagents (100 Pack)
1	pH 4.01 Calibration Solution
1	pH 7.00 Calibration Solution
1	EC 1413µS Calibration Solution
2	Sterilised Water for Membrane Lauryl Sulfate Broth Preparation
1	Arsenic Economy Test Kit (300 Tests)
1	Cotton Drawstring Backpack

Section 3

AquaSafe

Micro-biological Incubator

Instruction Manual

Contents

1.0 Introduction

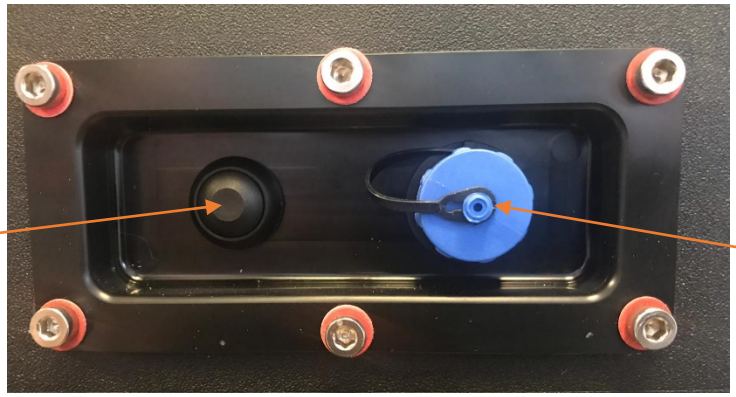
The AquaSafe® Single Incubator is a portable incubator for the incubation of microbiological samples prepared using the membrane filtration method. The incubator is primarily designed to be used with the supplied 54mm x 3.5mm aluminium petri dishes which are suitable for 47mm membrane filter pads, but the incubator can also be used with 55mm pre-prepared plastic petri-dishes.

The incubator is supplied with 25 Petri dishes as standard but has the capacity for more due to the Petri-Lok® system.

The incubator has the option to run 37°C, 44°C and user defined temperature profiles for periods of 1 – 24 hours.

2.0 Incubator set-up

The incubator is integrated into the waterproof carry case with a docking station which incorporates the rechargeable battery pack and power supply for the unit. An external charger is also supplied which is connected to the port on the rear of the case.



The power pack is comprised of a 12V 15.6Ah Sealed **Non-Spillable** Lead acid battery. The battery pack must be electrically isolated during transport on-board aircraft. To facilitate this, a switch has been incorporated in the carry case which isolates the power supply.

Please note when transporting via aircraft the switch must be in the off position (depressed) and secured such that it cannot become depressed during transit (covering the recessed plate with rigid card should achieve this).

2.1 Docking Station

The Incubator is mounted on a docking station built into the carry case, which incorporates the rechargeable battery pack and allows the incubator to be run from the batteries during transportation. It is also possible to use the incubator on a bench independent of the dock if desired, as long as it is connected to a 240 V AC outlet via the cables provided.

To remove the incubator from the docking station, lift the incubator vertically upwards, ensuring not twist or tilt the incubator as this could result in damage to the connectors. To place the incubator back onto the docking station, centre the incubator left to right on the docking station with the front edge against the foam, then push down into position.

2.2 Battery Removal

It may be desired to remove the batteries or replace them at the end of their life. To replace or remove the batteries first ensure the switch on the rear of the carry case is in the off position then remove the screw on the left side of the docking station.

Next lift up the hinged panel from left to right which will reveal the two batteries. To remove the batteries lift each battery out carefully and disconnect the wires from the battery terminals. Replacement is the reversal of removal. Ensure that the brown wires go to the red terminals and that the blue wires go to the black terminals. Failures or damage arising due to incorrect connection of the wires will invalidate the warranty. It is also advised that batteries are only removed if absolutely necessary.

2.3 Battery Charging

It is recommended to charge the battery fully prior to use. To do this remove the power supply unit from the kit and connect it to the charging connection on the rear of the carry case, screwing firmly into position. Plug the other end into a 90 - 240V AC outlet, then switch on the unit via the on/off switch on the rear of the case.

The indicator on the charger will illuminate red, orange or green. The states indicate battery condition as follows:

Red: discharged.

Orange: Partially charged.

Green: Fully charged.

To charge the battery from a discharged state takes approximately 4-6 hours.

If desired the incubator can be used whilst the battery is being charged however the battery will charge at a lower rate.

Note: The battery charger comes complete with an IEC C19 to UK mains lead. Replacement leads must be of the same type with a sealed plug and maximum cable length of 2 metres, and must carry the CE mark.

2.4 Vehicle Power

The incubator is also supplied with a vehicle cigarette lighter cable. This cable can either be plugged into the socked on the rear of the carry case or into the incubator on the right side of the unit. Then plug the cigarette lighter plug into the cigarette lighter socket in the vehicle. 12V or 24V vehicle systems may be used. Note that the internal battery will not charge while connected to the vehicle. It is advised that the vehicle's engine should be running for the majority of the period of time that the incubator is used to prevent discharge of the vehicle battery. Alternatively an auxiliary battery may be used (cable available separately).

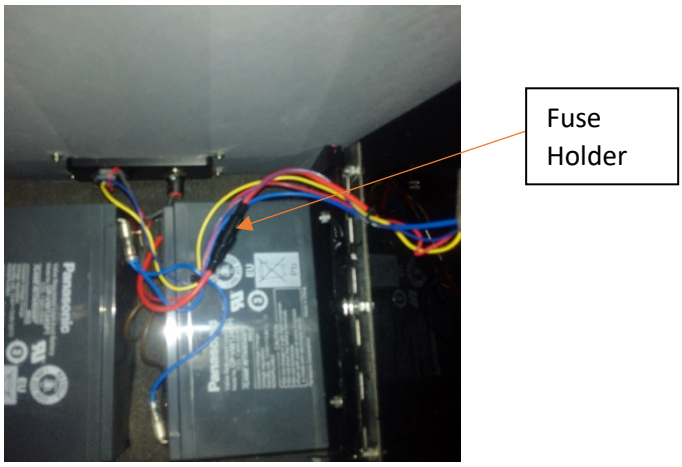
Note: The vehicle cigarette lighter charging lead is a specialist product and as such only a genuine Trace2o® replacement should be used. Replacements are available from any Trace2o® approved representative.

No attempt should be made to charge or power the equipment other than via the approved Trace2o® equipment.

2.5 Fuse

The docking station contains a fuse to protect the incubator in the unlikely event of a short circuit or thermal runaway. In the event of fuse failure the fuse may be replaced, provided the cause of the fault is identified and rectified.

To replace the fuse, locate the fuse holder in the battery compartment as illustrated below:



Unscrew the fuse holder and remove the fuse. Replace with the same type (only as specified in section 5.1) and screw the fuse holder back together.

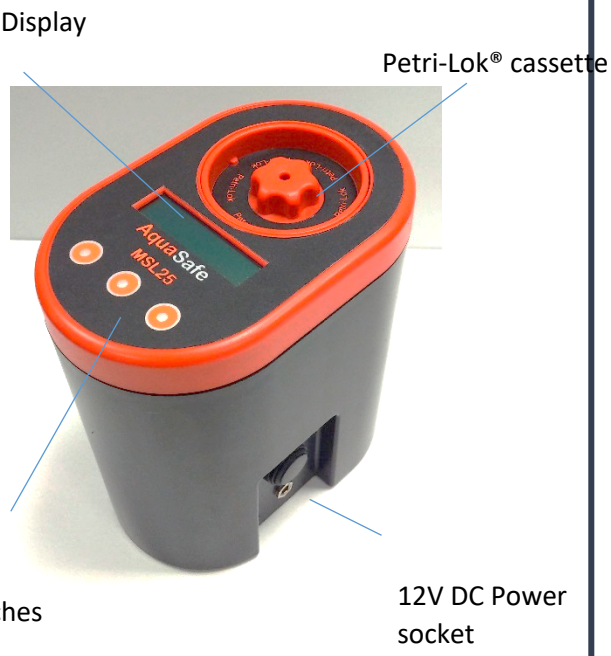
3.0 Operating instructions

3.1 Incubator controls

The incubator has a power connection socket on the right hand side of the unit and three switches on the top which control all functions of the incubator.

The incubator can be run from a power supply in the range 12 – 24 Volts.

All information is displayed to the user via the LCD display on the top of the unit.



Petri-Lok® Cassette.

The Petri-Lok® cassette consists of a rack and a spring loaded top to hold the petri-dishes in place. To remove the cassette twist the cassette to the left and lift out. The top of the cassette is removed by pushing down on the top whilst holding the rack, twisting to the left and then removing the top. To re-fit align the arrow with either of the two slots in the top of the rack, push down and twist lock into place.

3.2 Getting started

Instructions for membrane filtration are covered in another section of the kit manual.

The user should familiarise themselves fully with the set-up, control and calibration of the incubator prior to carrying out tests for the first time.

If the incubator is connected to the docking station, turn on using the switch on the rear of the carry case. If connected directly to the power supply turn on the power at the AC mains outlet.

The incubator screen will turn on.

The incubator may be in one of three operating modes on power up:

1: New run

2: Partial incubation cycle (Idle)

3: Partial incubation cycle (Run)

If the incubator is in mode 1 or 2 the screen shown in Fig 1.0 (see page 8) will be displayed. If the incubator is in mode 3 the incubator will return to the last know state and auto start the incubation cycle from where it was before the power was removed. Mode 3 is primarily intended for unattended power failure conditions.

If Fig 1.0 is displayed and the incubator was in mode 2 then the previous incubation cycle can be restarted from where it was left by pressing restart. This will be discussed later.

The screen will be displayed for 60 seconds before defaulting to the restart condition.

Pressing the right hand switch will reset the incubator ready to set-up and start a new incubation cycle and the screen will change to the one shown in Fig 1.1 (see page 8).

Pressing the left hand button will step through the screens as illustrated in the cyclic sequence shown in Figures 1.1 to 1.8.

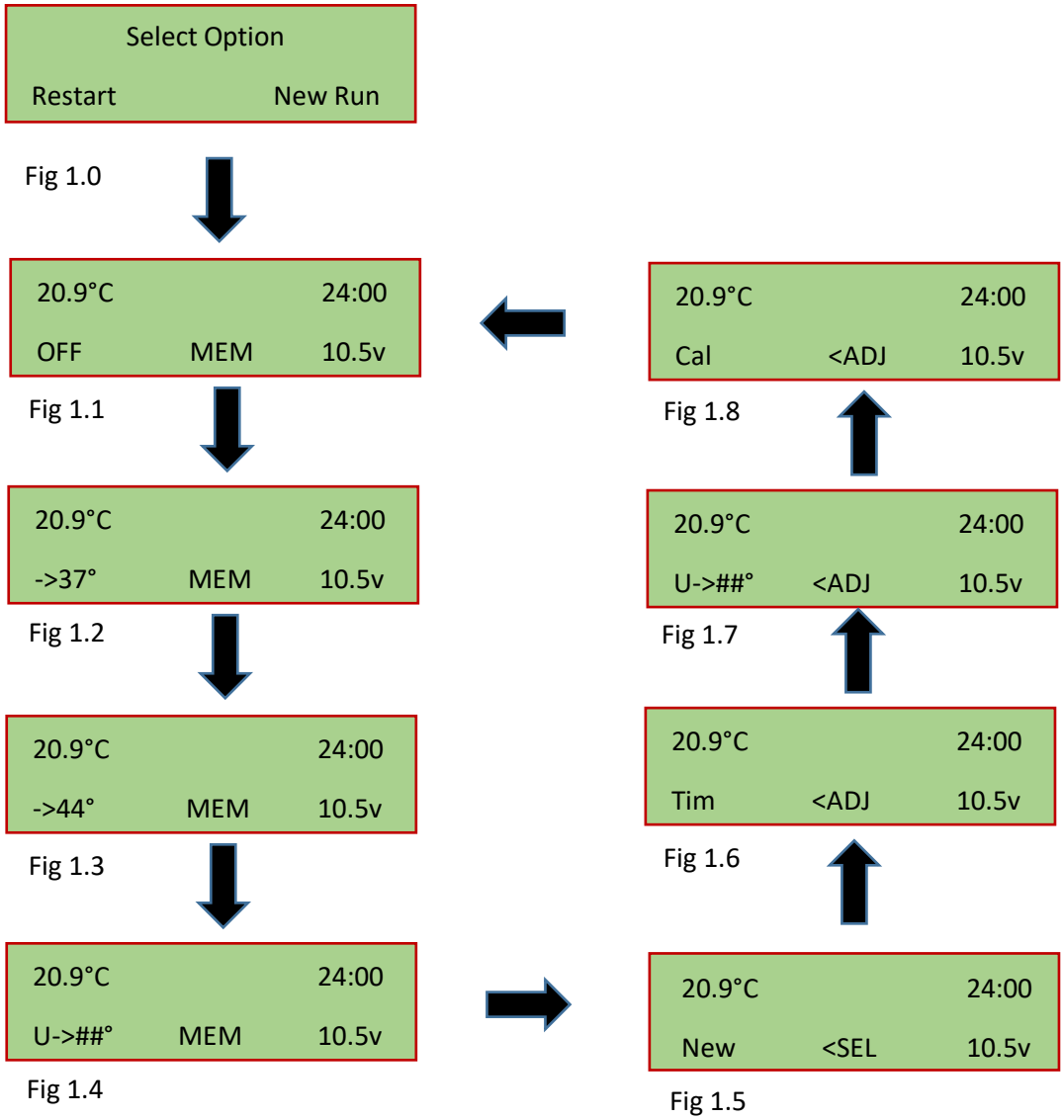
Each screen and options will now be discussed in further detail.

3.3 Menu Options

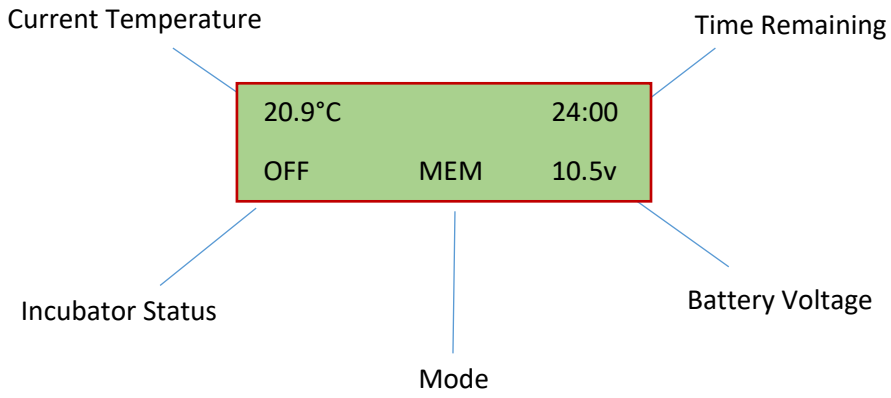
The incubator is a menu driven system. In section 3.3.1 the menu sequences will be outlined. In section 3.3.2 onwards, the detailed instructions for each screen will be described for the chamber. Once the incubator is in run mode, changes cannot be made to the settings of the chamber. To make changed to the settings or the sequence, the user will need to exit the run mode. This is to prevent accidental changes to an incubation cycle which may cause the test to fail.

3.3.1 Menu sequence

Once the user has selected Restart or NewRun, pressing the left switch will step through the following sequence.



3.3.2 Start Screen (Figure 1.1)



This screen shows the current status of the incubator.

In the state shown the incubator is in idle mode and not running.

3.3.3 37°C Program (Fig 1.2)

20.9°C		24:00
->37°	MEM	10.5v

This mode is the pre-programmed default 37°C incubation cycle. In this mode the incubator will run an 18 hour incubation cycle at 37 °C. The timer can be altered to any setting between 0 and 24 hours. Adjusting the incubation time is described in section 3.3.7.

Pressing and holding the middle switch for 5 seconds will start the incubation cycle and the display will change to the following:

*20.9°C		24:00
->37°	RUN!	10.5v

The asterisk preceding the temperature will switch on and off indicating the status of the heater.

To stop or pause the incubation cycle press and hold the middle switch again for 5 seconds. The display will return to the one shown in Fig 1.2.

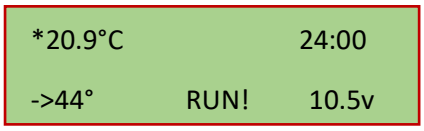
Once the chamber has reached the pre-set temperature the timer will start to countdown. If for any reason the temperature should drop, such as power failure, the timer will auto pause until the temperature is back to the pre-set temperature. It should also be noted that if there is a power failure the timer will reset back to the nearest hour. So a reset at 17:35 would result in a reset to 17:00.

The timer displayed is a countdown timer so it will display the time left not the elapsed time. When the timer reaches 00:00 a buzzer will sound intermittently and the display will display done A where A is the chamber.

3.3.4 44°C Program (Fig1.3)

This mode is the pre-programmed default 44°C incubation cycle. In this mode the incubator will run a 24 hour incubation cycle at 44°C. The timer can be altered to any setting between 0 and 24 hours. Adjusting the incubation time is described in section 3.3.7.

Pressing and holding the middle switch for 5 seconds will start the incubation cycle and the screen will change to the following:



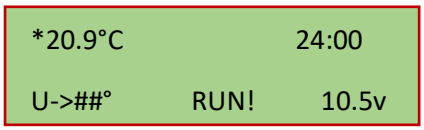
The asterisk preceding the temperature will switch on and off indicating the status of the heater.

To stop or pause the incubation cycle press and hold the middle switch again for 5 seconds. The display will return to the one shown in Fig 1.2.

3.3.5 User defined Program (Fig 1.4)

This mode will run an incubation cycle at the user defined temperature for 24 hours. Adjusting the user defined temperature is described in section 3.3.8. The timer can be altered to any setting between 0 and 24 hours. Adjusting the incubation time is described in section 3.3.7.

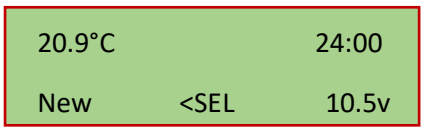
Pressing and holding the middle switch for 5 seconds will start the incubation cycle and the screen will change to the following:



The asterisk preceding the temperature will switch on and off indicating the status of the heater.

To stop or pause the incubation cycle press and hold the middle switch again for 5 seconds. The display will return to the one shown in Fig 1.2.

3.3.6 Resetting the timer (Fig 1.5)



In this mode pressing the middle switch will display the following screen which will flash rapidly to warn the user this will reset the timer and the elapsed time data will be lost:

The time remaining is displayed in the top left corner. This can be reset to the programmed default cycle time by pressing the middle switch. After the switch press it will jump to the screen shown in Fig 1.1. Should this mode be entered by mistake do not press the middle button. Turn off the incubator and then turn back on which will exit this mode and return to the menu without resetting the timer.

3.3.7 Incubation cycle time setting (Fig 1.6)

20.9°C		24:00
Tim	<ADJ	10.5v

In this mode the default cycle time can be changed from 24 hours to anywhere between 0 and 24 hours.

Before adjusting the cycle time, reset the timer as described in section 3.3.6.

To adjust the time press the middle switch. The screen will change to:

18:00		TIMER A
-	Save	+

Pressing the left switch will decrease the time and pressing the right switch will increase the time. When the desired time has been set press and hold the middle switch to save the settings. The display will return to the one shown in Fig 1.1.

3.3.8 User defined temperature setting (Fig1.7)

20.9°C		24:00
U->##°	<ADJ	10.5V

In this mode the user defined incubation temperature can be adjusted to a temperature between 20°C and 50°C.

To adjust the temperature press the middle switch. The screen will change to:

##.#°C	User Temp	
-	Save	+

Use the left switch to decrease the temperature and the right switch to increase the temperature. When the desired temperature is set press and hold the middle switch to save the settings. The display will return to the one shown in Fig 1.1.

3.3.9 Calibration (Fig 1.8)

20.9°C		24:00
Cal	<ADJ	10.5V

Fig 3.1

In this mode the incubator is calibrated.

To calibrate the unit the following equipment is required:

- Digital thermometer with 100mm x 4mm stainless steel probe (Included)
- Trace2o® Incubator calibration pack (Included)
- Petri-Lok® Petri-dish cassette
- 10 Aluminium Petri dishes

Assemble the cassette as follows (Fig 3.1):

- Place 10 empty Petri dishes into the bottom of the cassette
- Then place the calibration pack into the cassette
- Fit the spring loaded top and insert the thermometer through the hole in the top. The thermometer will protrude by approximately 30mm when fully inserted

Fit the cassette into the incubator chamber.

Set the incubator to the desired mode of operation (37/44/User) and start the incubation cycle. Wait at least 1 hour.

Compare the displayed temperature on the incubator screen to that shown on the thermometer. If there is a difference > 0.2°C the calibration should be adjusted as follows:

Exit the run mode and step through the screens until the calibration screen is displayed. Press the middle switch to enter calibration mode. The following screen will be displayed:

##.#°C		Calibrate
-	Save	+

Adjust the temperature up or down using the left and right switches until it matches the temperature displayed on the thermometer. Press the middle switch to save the settings.

Step through the screens until the mode previously used for calibration is displayed and start the incubation cycle again.

Allow the incubator time to adjust the temperature which could take up to 30 mins and check the calibration again. If the original temperature was significantly different to the thermometer then the calibration steps may need to be repeated two or three times.

4.0 Care and Maintenance

4.1 General

The AquaSafe® incubator is designed to require minimal maintenance if used correctly and the instructions herein are adhered to, although from time to time cleaning and basic maintenance will be required as outlined in sections 4.2 and 4.3.

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

4.2 Cleaning

Before cleaning the incubator ensure that the power supply is disconnected, the incubator is turned off and has cooled down.

After cleaning ensure all parts are thoroughly dried prior to operation.

To clean the incubator outer surfaces and plastics use a cloth moistened with a mild soap solution or an alcohol impregnated cloth or wipe. **Do not** use acetone or other solvents.

The incubator is splash proof but it is not fully waterproof so it should not be left outside in wet conditions and **must not** be submersed in water.

The incubator chamber is sealed at the bottom so spills will not affect the unit but should be cleaned as soon as possible. The Aluminium chamber can be cleaned with Alcohol, soap or solvent based cleaners. **Do not** use abrasive or chlorine-based cleaners.

The Petri-Lok® rack can be steam sterilised if required but it is not recommended to steam sterilise the top.

The AquaSafe® carry case and integral docking station is waterproof when the lid is fully closed and the connector cap is fitted. When closed the case can be washed with a mild soap solution or rinsed with a hose. The case is also resistant to most solvents and acetone.

Internally the case can be cleaned with a damp cloth but water should not be allowed inside as this could result in a short circuit, causing the batteries to overheat. **If water was to penetrate the case, turn off the incubator immediately, open the docking station and disconnect the batteries**. Dry as soon as possible and ensure it is thoroughly dried before reconnecting the batteries and operating the incubator.

4.3 Maintenance

The wheels should be periodically cleaned. When dry add a drop of lubricating oil to the wheel axles to prevent seizing.

All screws in the case are fitted with anti-vibration nuts or secured with adhesive. However, after transporting the case in a vehicle, it is suggested to check the integrity of the docking station and any screws to ensure no damage has occurred and all electrical connections are secure prior to use.

After a period of time replacement of the rechargeable lead acid batteries may be necessary. If so these must be replaced with batteries of the same type as specified in section 5.1 and replaced as a pair.

Should any fault occur please contact the Trace2o® Technical Team who will be more than happy to advise you.

5.0 Technical Specification

5.1 Docking station:

Power supply	
Input (Max)	12-28V DC, 48W (via supplied Power supply unit or vehicle charging lead only)
Output (Max)	12-28V DC, fused 24W
Fuse	2A Type T
Environmental	
Operating temperature range	15 – 50°C
Storage temperature	0 – 70°C
Protection	
Water ingress (Closed)	IP68 (1hr, 0.2m)
Buoyancy	47Kg
Batteries	Panasonic UP-VW1245P1 Rechargeable Lead Acid Battery 12V, 7.8Ah

5.2 Incubator:

User Interface	
Display	16 x 2 LCD
Keypad	3 key, tactile chemical resistant keypad
Power supply	
Input (Max)	12-28V DC, 24W (via supplied Power supply unit vehicle charging lead or docking station only)
Environmental	
Operating temperature range	0 – 50°C
Storage temperature	0 – 70°C
Protection	
Water ingress (Closed)	IP68 (1hr, 0.2m)
Buoyancy	47Kg

6.0 Guarantee and Assistance

Trace2o® hope that the AquaSafe® incubator will give many years of trouble free operation, but in the event of a technical problem occurring the AquaSafe® incubator is covered by Trace2o® Ltd's standard Guarantee terms and conditions available via email or via download from www.trace2o.com.

In the event that any technical assistance is required, the Trace2o® Customer Service department will be happy to assist. Contact details as follows:

Trace2o Ltd
The Technology Centre
Station Road
Thatcham
Berkshire
RG19 4HZ
UK
T: 01635 866772
E: Technical@Trace2o.com

Trace2O

Section 4

AquaSafe

Membrane Filtration Instruction Manual

Contents

SECTION 1: ASSEMBLY OF FILTRATION APPARATUS

1. Hand Vacuum Pump
2. Filtrate Flask / Waste Beaker
3. Sampling Cup and cable
4. Graduated Aluminium Funnel
5. Membrane Support & Holder
6. Sealing Gaskets
7. Glass Sintered Disc (Membrane Support)

Place one gasket within the recess of the support holder and press into place. Place the sintered disc, smooth side facing upwards, into the centre of the gasket. Push the other two gaskets into place around the sintered support disc.

The graduated funnel screws clockwise into position. Do not over-tighten the funnel.

SECTION 2: PREPARING BACTERIOLOGICAL MEDIA IN A LABORATORY FACILITY

Membrane Lauryl Sulfate Broth: For 50 tests, dissolve 7.62g of Membrane Lauryl Sulfate Broth (one sachet) in 100mL deionised water.

The broth is supplied in a pre-weighed sterile sachet, with indicating silica gel that will turn from orange to green, to indicate moisture penetration.

Tear open the sachet and remove the silica gel with the forceps. If the silica gel is green, discard the sachet without using.

Pour the entire contents of the sachet into 100mL of deionised water.

Gently heat the mixture to ensure that the powder is fully dissolved, but do not boil.

After ensuring that the 125mL plastic bottles provided contain no residues of previous MLSB or cleansing agent, pour the prepared medium carefully into the bottles.

Replace bottle lids but leave them slightly loose - do not fully tighten.

Sterilise in an autoclave at 121°C for 10 minutes, or place bottles in a pressure cooker and maintain in steam at pressure for 15 minutes. Remove the bottles, allow them to cool to room temperature, fully tighten the tops and then store in a cool, dark place.

When the media has cooled to room temperature, pour sufficient MLSB (2mL) onto each membrane pad to saturate the pad.

When the pad is fully saturated, decant any excess MLSB as waste

Media Ampoules: Media Ampoules are pre-sterilised ampoules containing 2 mL of dissolved media. They have the advantage of convenience and of always being sterile. These ampoules are available for Faecal Coliform Counts (pack of 50) and Total Coliform Counts (pack of 50). Simply unscrew the cap, pour the media onto the pad and discard the empty ampoule.

SECTION 3: PREPARING BACTERIOLOGICAL MEDIA IN THE FIELD

Membrane Lauryl Sulfate Broth: For 50 tests, dissolve 7.62g of Membrane Lauryl Sulfate Broth (one sachet) in 100mL deionised water.

The broth is supplied in a pre-weighed sterile sachet, with indicating silica gel that will turn from orange to green, to indicate moisture penetration.

Tear open the sachet and remove the silica gel with the forceps. If the silica gel is green, discard the sachet without using.

Open a bottle of 'Sterilised water for broth preparation' and carefully pour the entire contents of the sachet into the bottle.

Replace the bottle lid tightly, and vigorously shake the mixture to ensure that the powder is fully dissolved.

Use the syringe provided to dispense 2mL of prepared broth onto each membrane pad.

SECTION 4: SAMPLING

Rivers and streams

Take the sample as near as possible to the fastest flow – this will typically be found towards the centre of the body of water. Avoid taking samples from too close to the bank, where the water may be still and unrepresentative.

Care must be taken not to introduce floating debris, or solid matter from the banks of the water course, into the water sample. Therefore, it may be preferable to attach the sampling cable to the sterilised sampling cup and take the sample from a bridge or other overhanging location. Alternatively, the cup may be cast out into the water from the edge and pulled slowly and carefully back towards the operator.

Chlorinated drinking water

When storing samples of water in bottles for analysis at a later date, from sources that contain residual chlorine, such as treated drinking water, the bottled sample must be dechlorinated, i.e. the residual chlorine has to be removed to prevent further chlorination (and killing of bacteria) whilst in transit.

To dechlorinate the water, the supplied sample collection bottles contain dechlorination tablets.

N.B. If the sample is analysed immediately on-site, then it is not necessary to dechlorinate the water.

Dechlorination

The dechlorination tablets are pre-placed inside each sample collection bottle.

Simply pull off the sterile seal, pour the sample from the sampling cup into the sample collection bottle, seal and shake thoroughly to ensure thorough dissolving of the tablet.

The tablet will have no adverse effect on unchlorinated water.

Tap Samples

Turn on tap and allow water to flow for about 2 minutes, to flush the sampling pipeline.
Take an initial sample and carry out any appropriate on-site physical & chemical tests e.g. Residual chlorine, turbidity, temperature & pH.
Take any other required physical and chemical samples.
Then disinfect the tap, which can be carried out in the two following ways:

Chemical Disinfection of Tap

Turn off the tap.
Squirt the inside of the tap with concentrated sodium hypochlorite solution (e.g. bleach), with a wash bottle.
Leave for 3 minutes to disinfect fully.
Flush the tap until all the bleach has been washed off – this can be verified by taking further residual chlorine tests.
Fill the prepared bacteriological sampling bottle (leave a slight air gap at the top) and seal the lid tightly.

Heat Disinfection of Tap

This method is applicable for metal taps, but not for any plastic taps or taps with non-removable anti-splash devices.
Turn off the tap fully, and flame the closed tap with a small Propane or Butane burner; cease flaming if/when any steam issues from the tap.
Flush the tap until the water cools to its original temperature.
Fill the prepared bacteriological sampling bottle (leave a slight air gap at the top) and seal the lid tightly.

Dip Sample

Sterilise the sampling cup by igniting 1ml of methanol/alcohol in the cup.
Allow to cool.
Rinse the alcohol from the cup with water from the sample source.
Immerse the cup into the water source to obtain the sample.
Pour into the prepared bacteriological sampling bottle (leave a slight air gap at the top) and seal the lid tightly.

SECTION 5: USE OF BACTERIOLOGICAL MEDIA

If stored correctly, the dissolved media should remain stable for 6-8 weeks. However, if there are any signs of contamination e.g. yellowing, cloudiness etc., discard.

Ideally, to reduce the possibility of contamination, use one bottle of media only for a 24 hour period, and use a fresh bottle on each subsequent day. However, if this is not possible, then the bottle must be resealed immediately after use. The media may be re-sterilised if required by boiling in a water bath for 15 minutes.

Clean empty media bottles thoroughly before re-use. Any residues should be washed out with hot water; cleaned with a little detergent (a small brush can be used if required); rinsed several times in clean water, dried and stored in a clean environment, with the lids lightly attached.

The MLSB solution may be applied to the pads up to 6 hours before sampling, if the pads are subsequently stored in a cool environment. This procedure can reduce the potential for contamination with excessive operations in the field.

If the MLSB powder is stored in the original sachets in dry, cool conditions it should have a shelf life of up to 5 years from the date of manufacture.

SECTION 6: ASEPTIC PROCEDURES

Aseptic procedures are of paramount importance during microbiological analysis, and extra care must be taken when outside the central laboratory, i.e. in the field.

Everything must be kept clean and sterile, particularly on the following surfaces:

Inner surface of the sampling cup

Inner surface of the graduated filter funnel

Filter membrane and absorbent pads

Upper surface of the sintered membrane support disc

Inside of the petri dishes

Support pad dispenser arm, and forceps

Before every use, rinse the filtration unit and sampling cup in clean water, and dry by using clean tissue paper.

Pour approx. 1 mL of methanol into the sampling cup and swirl. (The methanol can be stored in the plastic bottles provided).

Place the sample cup in a normal upright position, away from any flammable substances.

Using a suitable means (cigarette lighter), ignite the methanol – TAKE CARE AROUND THE NAKED FLAME.

Allow the methanol to burn for a few seconds.

Whilst the methanol is still burning, invert the filtration unit and carefully place inside the sample cup.

Wait for at least 20 minutes to ensure that the sample cup and filtration unit are sterile. Methanol burns anaerobically to form formaldehyde gas, which reaches all areas of the filtration apparatus and ensures a thorough sterilisation.

Pour any residual methanol solution away.

The above sterilisation procedures should be carried out immediately before sampling, and after the filtration of each sample.

Reusable aluminium petri dishes must be sterilized, either by immersing in boiling water, or flaming with methanol prior to use. After sterilisation, ensure that the dishes are allowed to dry thoroughly before use. Other methods of sterilisation can be employed, including autoclaving, or placing the aluminium dishes in a conventional oven at 300°C for 30 minutes. Once sterile, the petri dishes should be handled carefully to prevent subsequent recontamination.

Pads are supplied sterile, in cartridges of 100. A sterile pad dispenser is supplied for depositing the pads into the petri-dishes. It is preferable to dispense pads at the central laboratory, prior to going to the sampling point; in this way, the dispenser may be kept attached to a pad cartridge and remain clean and sterile. If it is necessary to dispense pads in the field, great care must be taken not to contaminate either the pad dispenser or the cartridge. As soon as a cartridge is finished, a new one should be attached to the dispenser. Do not leave the dispenser unattached for any length of time. If no pad dispenser is available use sterilised forceps.

Before handling a membrane filter with the forceps, the forceps should be flame-sterilised thusly: hold the forceps tips in a flame for at least 5 seconds, and allow to cool before handling the membrane.

SECTION 7: PROCESSING SAMPLES FOR COLIFORM ANALYSIS

All samples must be incubated within 6 hours of sampling.

Dispense a sterile absorbent pad into a sterile petri dish, and saturate the pad with prepared broth

Loosen the graduated filter funnel, and remove from the base support.

Sterilise the forceps and allow to cool. Using these forceps, place a sterile membrane onto the glass membrane support, grid side up. If the membrane tears or becomes contaminated, discard it and use a new one.

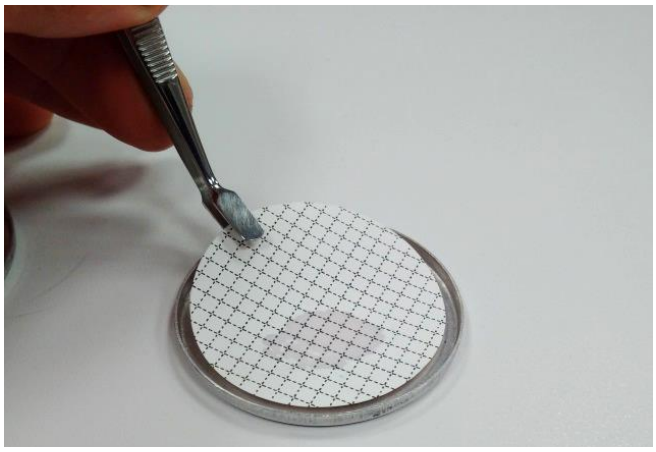
Lock the membrane in place by screwing the filter funnel down into position.

Pour the water sample into the filter funnel up to the 100 ml graduation.

Connect the hand vacuum pump to the filtration unit base (ensuring the arrow is orientated to the direction of desired air flow) and pump in a controlled fashion to suck the water sample through the membrane.

When all the water has been filtered, release the vacuum pump and use the sterile forceps to take the membrane from the filtration unit.

Place the membrane on top of the pad, which has been previously saturated with the MLSB media.



Replace the petri-dish lid and mark the petri dish. A suitable system should be adopted to record the petri dish mark, associated with the sample number, place, date, time, etc.

Place the petri-dish into the rack. Repeat the process for all the samples and then place the filled rack into the incubator.

It is important to note that when the last sample has been processed, a resuscitation period of at least one hour (but not more than four hours) must be observed before incubating. This allows any physiologically stressed coliforms to recover before culturing.

To incubate faecal (thermotolerant) coliforms, temperature of 44.5°C should be used. For total coliform analysis, a temperature of 35°C is appropriate.

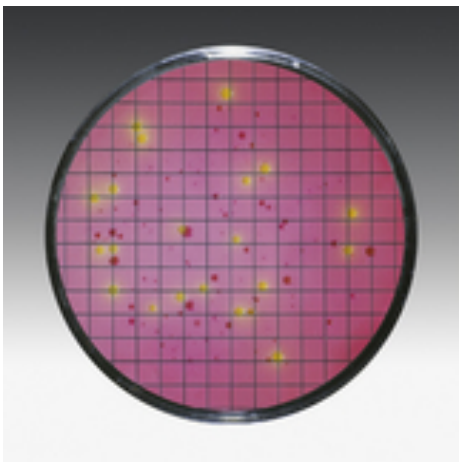
SECTION 8: COUNTING COLIFORMS AND RECORDING THE RESULT

Note the temperature that the incubator has been set for.

Following incubation, switch off the power and remove the petri dishes from the incubator.

Place the petri dishes on a flat, level surface.

Remove the lids and count all the yellow colonies, irrespective of size. Use the eye glass, if necessary. Count the colonies within a few minutes of removing from the incubator, as the colours are liable to change on cooling and standing. Ignore those colonies that are not yellow e.g. pink & transparent colonies.



Once the number of yellow colonies has been determined, and assuming that 100 mL of sample was filtered, this number of colonies equals the number of coliforms per 100 mL. Where samples were incubated at 35°C, the count is of Total Coliforms, whilst for those incubated at 44.5°C, the count is for faecal (Thermotolerant) coliforms.

Record the results using the record sheets (if provided in the kit).

SECTION 9: SELECTING THE OPTIMUM VOLUMES FOR MEMBRANE FILTRATION

The optimum volume of sample is that which will allow the most accurate quantification of bacterial colonies. This is achieved when the number of faecal (thermotolerant) coliform colonies on the membrane following incubation is between 20 and 200 colonies. If there are fewer than 10 colonies, then there exists the possibility of statistical error. Numbers greater than 200 colonies are difficult to count with the naked eye.

Potable Waters
The number of faecal coliform bacterial colonies in treated water samples should ideally be zero. Thus, the preferred sample volume is 100 mL, and a count of zero faecal coliform bacteria per 100 mL is indicative of a microbiologically safe water supply. If the count exceeds 1 faecal coliform per 100 mL, contamination is indicated. If the count exceeds 10 faecal coliforms per 100 mL, action is urgently required.

Raw Waters
For source waters and partially treated waters, including those which are ground water derived, it can be useful to adjust the sample volume in order to obtain faecal coliform counts in the optimum range 10-200. It may also be useful to process more than one quantity on the first occasion a particular water source is sampled. In such cases it is not necessary to re-sterilise the filtration equipment between different quantities of the same sample, provided that the smaller volume is processed first. Typical volumes which may be appropriate for various water types are shown in the following table. They are only guidelines; there is no substitute for experience of a given source.

	APPROPRIATE VOLUME (mL)		
SOURCE OF SAMPLE	100	50	10
Lakes, Reservoirs, & Rivers &	*	**	***
Wells, boreholes, other protected	*	**	*
Water treatment plant partially	**	**	*
Water treatment plant fully treated	***		
Distribution system	***		

*** Normal Volume or First Choice ** Likely Volume * Possible Volume

Trace2O

Section 5
AquaSafe

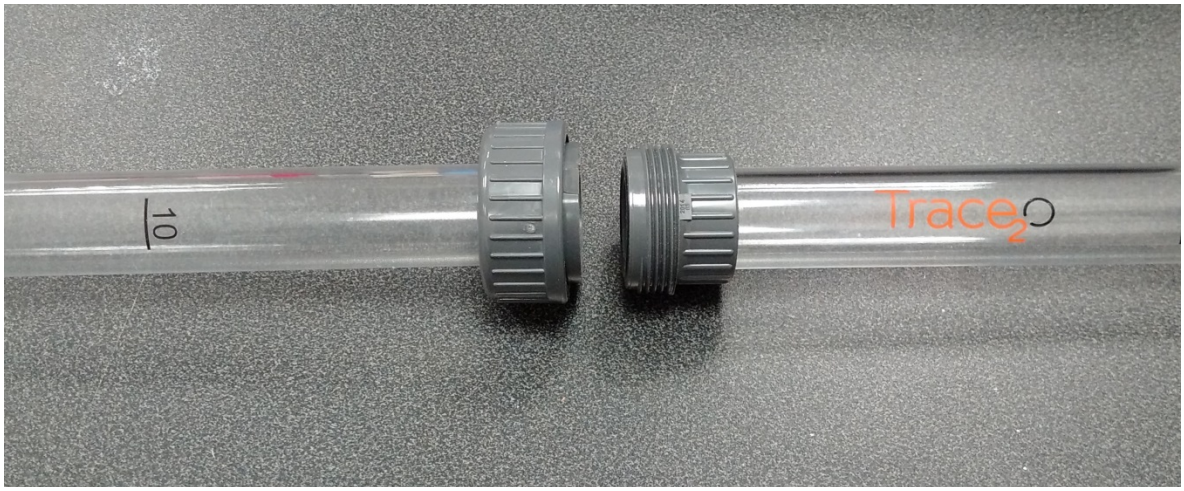
Turbidity Tube

Instruction Manual

SECTION 1: ASSEMBLY OF TURBIDITY TUBE

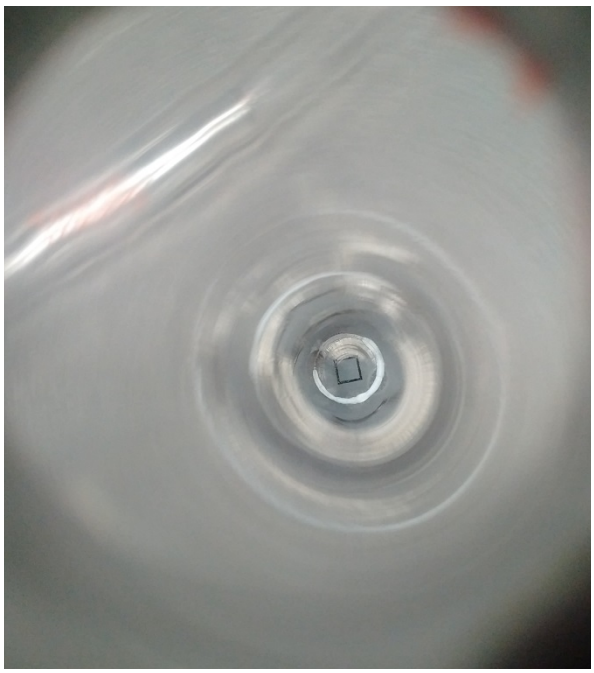
Carefully remove the two halves of the turbidity tube from their position, in the foam recess at the front of the AquaSafe Kit.

Align the two halves of the turbidity tube so that the graduations are easily visible, then push together the grey bolting mechanism and screw together using the grey waterproof connector.



SECTION 2: ANALYSIS

Good illumination is essential for accurate use of the turbidity tube.



Look through the open end of the tube, at the black square on the base of the tube. This is the Trace2o Secchi marker.

Hold the tube vertically, and slowly pour the water sample to be analysed into the tube, until the moment that the Secchi marker is no longer visible from the top of the tube.

Alternatively, fill the tube, then slowly pour small portions away, until the moment that the Secchi marker becomes visible from the top of the tube.

Hold the tube vertically, and identify the water level.

The turbidity value is that marked next to the graduation line nearest the water level.

The graduations follow a logarithmic scale, with the most critical values marked on the tube, and therefore the turbidity tube can only ever be an estimate for the turbidity of the water sample.

Note: bubbles may cause false readings.

The turbidity tube is calibrated to a person with normal (6/6) visual acuity.

Trace2O

Section 6

AquaSafe

Comparator

Instruction Manual

COMPARATOR

APPLICATION NOTE T2O-AN-C60

AMMONIA (C60) METHOD

The following application note explains the procedure for the detection of Ammonia (C60) using the Comparator.

Equipment:

- Comparator
- 2 x 10ml cells
- Stirring rod
- Ammonia Nos. 1 & 2 tablets

Safety:

- Consult the safety data sheet for all of the reagents before use. Even if you have used comparator reagents before, the formulation may have changed.

Getting started:

Fig 1.0 Comparator Disc

(Disc shown is for illustration purposes only)

Fig 1.1 Reference cell

Insert the comparator disc for Ammonia into the recess on the right hand side of the comparator with the numbers facing forwards as shown in fig 1.0

Fill the two vials to the 10ml mark with sample water

Place one in the left side of the comparator as shown in fig 1.1. This is the reference cell

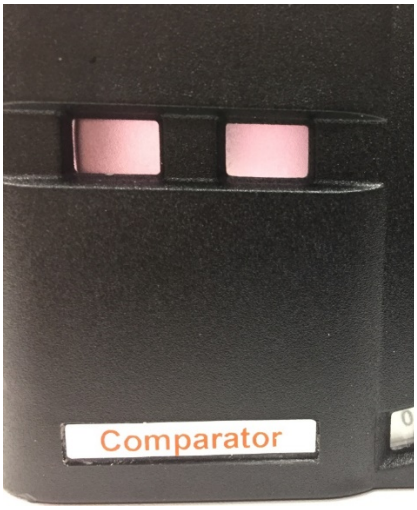
Sample preparation:

- Add **one Ammonia No.1 tablet** straight from the foil to the water sample in the second cell.
- Crush the tablet using a clean stirring rod, until no large pieces are visible.
- Add **one Ammonia No.2 tablet** straight from the foil to the same sample.
- Crush the tablet using a clean stirring rod, until no large pieces are visible.
- Fit rubber stopper to the cell and invert several times until the tablet is dissolved.
- Leave the sample to stand for 10 minutes.

Analysis:

Fig 1.2 Test cell

Place the **test** cell in the **right side** of the comparator as shown in fig 1.2



Rotate the disc until colour match is obtained. Record disc reading that is displayed in the small viewing window to the bottom right.

Ammonia concentration is the reading on the disc.

Notes

- For best results, rinse vials thoroughly between with deionised water. Ensure that the outside of the vials are clean.
- The tablets must be added in the correct sequence. Ammonia No. 1 tablet will only dissolve fully after Ammonia No. 2 tablet is added.
- The tablets should be added direct from the foil avoiding contact with hands or surfaces.
- The temperature is critical for full sample development. Below 20°C, increase reaction time to 15 minutes.
- The tablets are unsuitable for determination of ammonia in sea water or brackish water due to precipitation of salts.
- Turbid samples should be filtered prior to analysis.

COMPARATOR

APPLICATION NOTE T2O-AN-C100

CHLORINE (C100) METHOD

The following application note explains the procedure for the detection of Chlorine (C100) using the Comparator.

Equipment:

- Comparator
- 2 x 10ml cells
- Stirring rod
- DPD No.1 & DPD No.3 Tablets

Safety:

- Consult the safety data sheet for all of the reagents before use. Even if you have used comparator reagents before, the formulation may have changed.

Getting started:

Fig 1.0 Comparator Disc

(Disc shown is for illustration purposes only)

Fig 1.1 Reference cell

Insert the comparator disc for Chlorine into the recess on the right hand side of the comparator with the numbers facing forwards as shown in fig 1.0

Fill the two vials to the 10ml mark with sample water

Place one in the left side of the comparator as shown in fig 1.1. This is the reference cell.

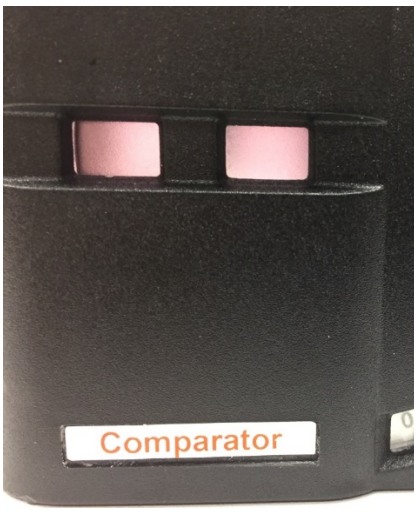
Free Chlorine Sample preparation:

- Add **one DPD No.1 tablet** straight from the foil to the water sample in the second cell.
- Crush the tablet using a clean stirring rod, until no large pieces are visible.
- Fit rubber stopper to the cell and invert several times until the tablet is dissolved.

Analysis:

Fig 1.2 Test cell

Place the **test** cell in the **right side** of the comparator as shown in fig 1.2



Rotate the disc until colour match is obtained. Record disc reading that is displayed in the small viewing window to the bottom right.

Free Chlorine concentration is the reading on the disc.

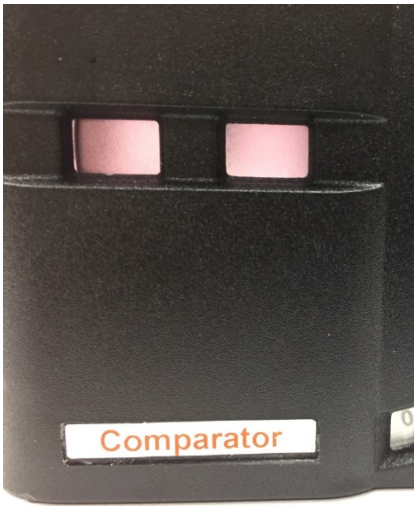
Total Chlorine Sample preparation:

- Remove the cell from the **right side** of the comparator.
- Remove the lid and add **one DPD No.3 tablet** straight from the foil to the water sample.
- Crush the tablet using a clean stirring rod, until no large pieces are visible.
- Fit rubber stopper to the cell and invert several times until the tablet is dissolved.

Analysis:

Fig 1.3 Test cell

Place the **test** cell in the **right side** of the comparator as shown in fig 1.3



Rotate the disc until colour match is obtained. Record disc reading that is displayed in the small viewing window to the bottom right.

Total Chlorine concentration is the reading on the disc.

Combined Chlorine mg/L (ppm) = Total Chlorine mg/L – Free Chlorine mg/L

Notes

- For best results, rinse vials thoroughly between with deionised water. Ensure that the outside of the vials are clean
- Take care not to shake or aerate the sample
- Store the reagents in a cool, dry place
- Turbid samples should be filtered prior to analysis for best colour match
- The tablets should be added direct from the foil avoiding contact with hands or surfaces

COMPARATOR

APPLICATION NOTE T2O-AN-C260

NITRATE (C260) METHOD

The following application note explains the procedure for the detection of Nitrate (C260) using the Comparator.

Equipment:

- Comparator
- 2 x 10ml cells
- Stirring rod
- Nitrate test tube
- Nitrate test powder
- Nitrate test tablet
- Nitrite LR tablet

Safety:

- Consult the safety data sheet for all of the reagents before use. Even if you have used comparator reagents before, the formulation may have changed.

Getting started:

Fig 1.0 Comparator Disc

(Disc shown is for illustration purposes only)

Fig 1.1 Reference cell

Insert the comparator disc for Nitrate into the recess on the right hand side of the comparator with the numbers facing forwards as shown in fig 1.0

Fill the two vials to the 10ml mark with sample water.

Place one in the left side of the comparator as shown in fig 1.1. This is the reference cell.

Sample preparation:

- Fill the nitrate test tube with 20ml of the water sample
- Add **1 level spoon of Nitrate Test Powder (using the spoon attached to the lid of the powder pot)**
- Fit the cap and swirl vigorously for one minute.
- Add **one Nitrate Test tablet** straight from the foil to the nitrate test tube. **Do not crush the tablet.**
- Refit the cap and swirl vigorously for 1 minute.
- Stand the tube upright, allow contents to settle, then invert gently 3 to 4 times.
- Allow to stand for a further 2 minutes, then open and wipe carefully around the rim to remove solid particles.
- Tip 10ml of the sample from the Nitrate test tube into the second 10ml sample cell
- Add **one Nitrite LR tablet** straight from the foil to the water sample in the second cell.
- Crush the tablet using a clean stirring rod, until no large pieces are visible.
- Fit rubber stopper to the cell and invert several times until the tablet is dissolved.
- Leave the sample to stand for 10 minutes.

Analysis:

Fig 1.2 Test cell

Place the **test** cell in the **right side** of the comparator as shown in fig 1.2

Rotate the disc until colour match is obtained.

Record disc reading that is displayed in the small viewing window to the bottom right.

Nitrate concentration is the reading on the disc.

Notes

- For best results, rinse vials thoroughly between with deionised water. Ensure that the outside of the vials are clean.
- The tablets should be added direct from the foil avoiding contact with hands or surfaces.
- Nitrite present in the sample will also react leading to a higher result. To correct, carry out a nitrite test (C270) on the sample and subtract the result.
- Nitrite concentrations above 1mg/l can be diluted up to 100x, with the result multiplied up accordingly to compensate.
- If the sample flocculates it is likely the sample contains high concentrations of Nitrate. Dilute the sample at least 10x and retest.
- Interferences may occur from the presence of the following ions: Antinomy (III), Iron (III), Lead, Mercury (I), Silver, Chloroplatinate, Metavanadate, Bismuth.
- Copper(II) ions may artificially lower the result.

COMPARATOR

APPLICATION NOTE T2O-AN-C270

NITRITE (C270) METHOD

The following application note explains the procedure for the detection of NITRITE (C270) using the Comparator.

Equipment:

- Comparator
- 2 x 10ml cells
- Stirring rod
- Nitrite LR tablet

Safety:

- Consult the safety data sheet for all of the reagents before use. Even if you have used comparator reagents before, the formulation may have changed.

Getting started:

Fig 1.0 Comparator Disc

(Disc shown is for illustration purposes only)

Fig 1.1 Reference cell

Insert the comparator disc for Nitrite into the recess on the right hand side of the comparator with the numbers facing forwards as shown in fig 1.0

Fill the two vials to the 10ml mark with sample water

Place one in the left side of the comparator as shown in fig 1.1. This is the reference cell

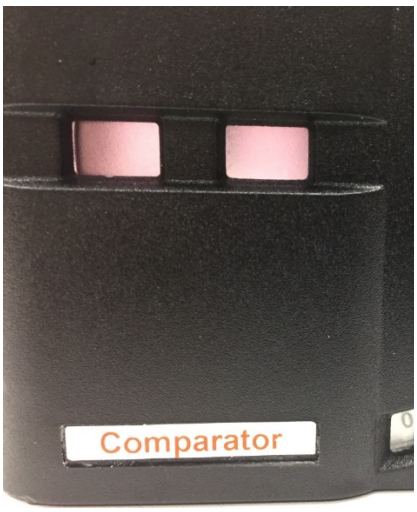
Sample preparation:

- Add **one Nitrite LR tablet** straight from the foil to the water sample in the second cell.
- Crush the tablet using a clean stirring rod, until no large pieces are visible.
- Fit rubber stopper to the cell and invert several times until the tablet is dissolved.
- Leave the sample to stand for 10 minutes.

Analysis:

Fig 1.2 Test cell

Place the **test** cell in the **right side** of the comparator as shown in fig 1.2



Rotate the disc until colour match is obtained. Record disc reading that is displayed in the small viewing window to the bottom right.

Nitrite concentration is the reading on the disc.

Notes

- For best results, rinse vials thoroughly between with deionised water. Ensure that the outside of the vials are clean.
- The tablets should be added direct from the foil avoiding contact with hands or surfaces.
- Interferences may occur from the presence of the following ions: Antinomy (III), Iron (III), Lead, Mercury (I), Silver, Chloroplatinate, Metavanadate, Bismuth.
- Copper(II) ions may artificially lower the result.

Section 7:

HydroLite®

HL101

Pocket pH Tester

Instruction Manual

Introduction:

The HydroLite® HL101 is a pocket-sized pH and temperature tester. This manual provides instructions on use, with a step-by-step operating guide, as well as care and maintenance instructions.

Components:

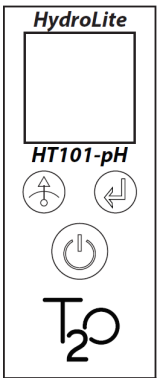
- HydroLite® HL101 pocket pH/temperature tester
- pH Buffer Solutions (pH4.01/7.00)

Please note: To ensure that the HL101 pocket pH meter is fully functional, the tip of the probe must be submerged in liquid during when not in use. If left to dry out, the electrode could be damaged and therefore affect the testing.

Trace2o uses a potassium chloride (KCl) fill solution in the cap of the meter. During transport, some of this solution may leak and dry out in the cap and on the probe, resulting in the formation of white potassium chloride crystals. This does not affect the device, and can be easily removed by rinsing the probe and cap in deionised water before carrying out testing.

Keypad:

The HL101 pocket pH/temperature tester uses a simple three-button membrane keypad, with graphical symbols to describe the function of each key.

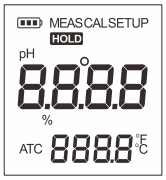


Map of keys and functions:

KEY	FUNCTION
On/Off Hold	• Power the unit ON/OFF • Freezes the currently displayed value for recording; press the key again to resume measuring. • When in calibration mode, exits calibration and returns to measurement mode.
Cal	• Press the key to enter the calibration mode. • Press and hold the key to enter the setup menu. • In the setup mode, press the key to select default options.
Enter	• Confirms the calibration or selected option.

Display:

The unit is equipped with a clear LCD display that is used to show measured value, units, mode indicators and function indicators.

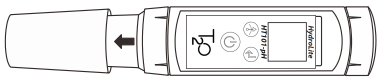


Map of mode indicators and descriptions:

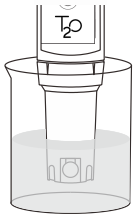
Mode indicator	Description
MEAS	Indicates unit is in the measurement mode
CAL	Indicates unit is in the calibration mode
SETUP	Indicates unit is in SETUP mode
HOLD	Indicates the measured value has been frozen
ATC	Indicates temperature compensation is enabled

Prior to Use:

- Remove the electrode protective cap from the unit.



- If the membrane on the electrode dries out, soak the electrode in 3M KCL solution or tap water for at least 15 minutes. DO NOT use distilled or deionised water, as this will shorten the life of sensor.



Power On/Off:

- Press ON/OFF key to turn on the unit, the display shows measured value.
- Press and hold the ON/OFF key for 5 seconds, the unit will turn off.
- If no key is pressed for 8 minutes, the unit will automatically turn off to conserve power.

Note: The auto-off function can be disabled if required – see below for further detail

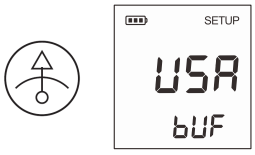
Setup Menu:

The HL101 pocket pH/temperature tester includes a comprehensive setup menu with customisable options to suit user measurement requirements.

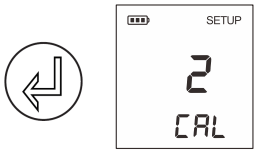
Menu item	Description	Available options	Details	DEFAULT?
bUF	pH Buffer	USA	USA Standard (pH4.01/7.00/10.01)	●
		nISt	NIST Standard (pH4.01/6.86/9.18)	
CAL	Calibration Points	1	1 point	
		2	2 points	●
		3	3 points	
UNIt	Temperature Unit	°C	Degrees Celsius	●
		°F	Degrees Fahrenheit	
°C	Temperature Calibration	CAL	Enters the temperature calibration mode	
HOLd	Auto-Hold	YES	Automatically freezes a stable reading	
		nO	Disable	●
OFF	Auto-Off	YES	Automatically turn off the unit	●
		nO	Disable	
rSt	Reset	YES	Restore factory settings	
		nO	Disable	●

Changing the default parameters:

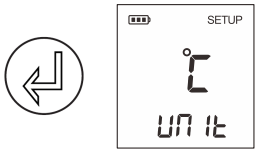
1. Press and hold the CAL key for 3 seconds to enter the setup menu; the unit goes to buffer standard selection mode, the display shows “USA/BUF” (USA standard).



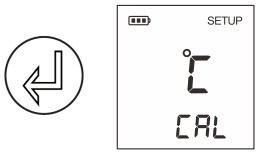
2. Press CAL key to select the USA or NIST standard for pH buffers. Press ENTER key to confirm; the unit goes into calibration point selection mode, the display shows “2/CAL” (2 points calibration).



3. Press CAL key to select the number of calibration points (1, 2 or 3 points). Press ENTER key to confirm; the unit goes into temperature unit selection mode, the display shows “°C/UNIT”.

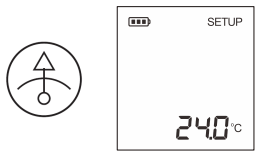


4. Press CAL key to select the temperature units (°C or °F). Press ENTER key to confirm, the unit goes into temperature calibration mode, the display shows “°C/CAL”.

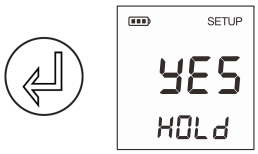


5. If you do not want to perform temperature calibration, press ENTER key; the unit goes to next option.

6. To perform temperature calibration, press CAL key to enter the temperature calibration mode, the display shows current temperature reading.

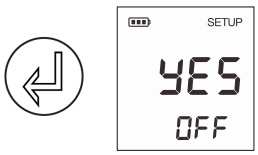


7. Press CAL key to set temperature value. Press ENTER key to confirm; the display shows “YES/HOLD” indicating that the auto-hold function is enabled.



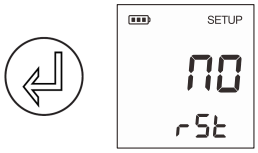
If the auto-hold function is enabled, the unit will automatically sense a stable endpoint reading and freeze the reading in the display. If you disable this function, the unit allows user to freeze the reading in the display manually by pressing the HOLD key.

8. Press CAL key to enable or disable the auto-hold function. Press ENTER key to confirm; the display shows “YES/OFF” indicating that the auto-off function is enabled.



When the auto-off function is enabled, if no key is pressed for 8 minutes, the unit will automatically turn off to conserve power.

9. Press CAL key to enable or disable the auto-off function. Press ENTER key to confirm; the display shows “NO/RST” indicating the current status of the reset function.



WARNING:

The Reset function will restore the unit back to factory default settings; all calibration values and selected parameters will be reset.

10. Press CAL key to enable or disable the reset function. Press ENTER key to confirm; the unit returns to measurement mode.

EXIT THE SETUP MENU:

During the setup mode, to exit the setup menu, press ON/OFF key; the unit will return to measurement mode immediately.

pH Calibration:

The HL101 pocket pH/temperature tester allows up to 3 point calibration. We recommend that you perform at least a 2 point calibration for best accuracy. The unit automatically recognises and calibrates to the following standard buffer values.

- USA Standard Buffer Options: pH 4.01, 7.00, 10.01
- NIST Standard Buffer Options: pH 4.01, 6.86, 9.18

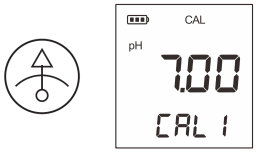
Single point calibration should only be carried out with pH 7.00 or pH 6.86, otherwise the calibration will not be accepted by the unit.

The unit must be calibrated prior to first use or whenever the electrode is replaced. To ensure optimum accuracy, regular calibration is recommended. Do not reuse calibration solution after calibration, contaminants in solution will affect the calibration and eventually the accuracy of the measurement.

SINGLE POINT CALIBRATION:

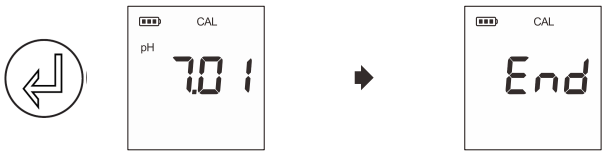
1.1 Ensure that 1 point calibration is selected in the setup menu.

1.2 Rinse the pH electrode with distilled water. Press CAL key; the unit shows “pH7.00/CAL1” or “pH6.86/CAL1”.



1.3 Immerse the pH electrode in the pH7.00 buffer solution; the end of the sensor must be completely submerged in the calibration solution. Stir the solution gently.

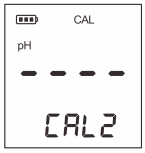
1.4 Press ENTER key to confirm. Wait for the measured value to stabilise; the display shows “END”. Single point calibration is completed.



2 POINT CALIBRATION:

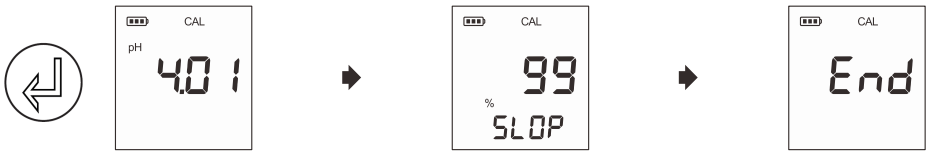
2.1 Ensure that 2 point calibration is selected in the setup menu.

2.2 Repeat steps 1.2 to 1.4 above. When the first calibration point is completed, the display will show “CAL2”. The unit prompts you to continue with second point calibration.



2.3 Rinse the pH electrode with distilled water. Immerse the electrode in the pH 4.01 buffer solution. Stir the solution gently.

2.4 Press ENTER key to confirm. Wait for the measured value to stabilize; the display shows electrode slope and “END”. 2 point calibration is completed.



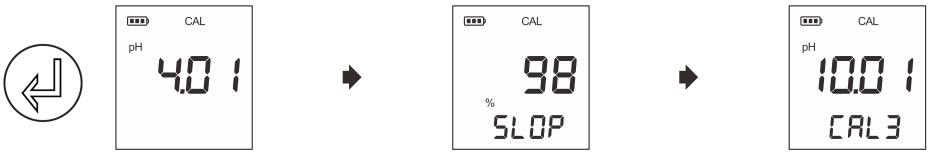
3 POINT CALIBRATION (not required for normal operation):

3.1 Ensure that 3 point calibration is selected in the setup menu.

3.2 Repeat steps 1.2 to 1.4 above. When the first calibration point is completed, the display will show “pH4.01/CAL2”. The unit prompts you to continue with second point calibration.

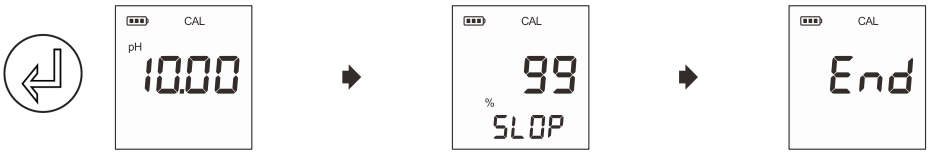
3.3 Rinse the pH electrode with distilled water. Immerse the electrode in the pH 4.01 buffer solution. Stir the solution gently.

3.4 Press ENTER key to confirm. Wait for the measured value to stabilise; the display shows electrode slope and “pH10.01/CAL3”.



3.5 Rinse the pH electrode with distilled water again. Immerse the electrode into the pH10.01 (or pH9.18) buffer solution. Stir the solution gently.

3.6 Press ENTER key to confirm. Wait for the measured value to stabilise; the display shows electrode slope and “END”. Calibration is completed.



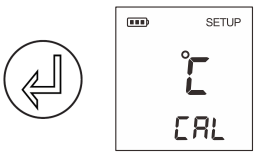
EXIT THE CALIBRATION:

During the calibration process, if you want to exit calibration, press ON/OFF key, the unit will return to measurement mode immediately.

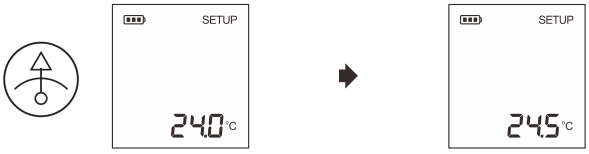
Temperature Calibration:

During the measurement, if the temperature reading displayed differs from that of an accurate thermometer, you need to calibrate the unit.

1. Press and hold the CAL key for 3 seconds to enter setup menu.
2. Press ENTER key until unit shows the “°C/CAL” or “°F/CAL”.



3. Press CAL key to enter the temperature calibration mode.
4. Press CAL key again to set temperature value (Resolution: 0.5°C).



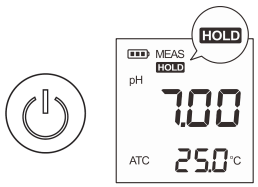
5. Press ENTER key to confirm, the display shows next option.
6. Press ON/OFF key, the unit returns to measurement mode. Calibration is completed.

pH Measurement:

Rinse the pH electrode thoroughly with distilled water. Immerse the electrode into the sample solution, stir the solution gently. Wait for the reading to stabilise; record the measured value as displayed.

Hold Function:

The HL101 pocket pH/temperature tester contains two data hold modes. When the Auto-Hold function is enabled, the unit will automatically sense a stable endpoint reading and freeze it; the “HOLD” indicator appears on the display. If the Auto-Hold function is disabled, press HOLD key, the unit will immediately freeze the currently displayed value. Press the HOLD key again to resume measuring.



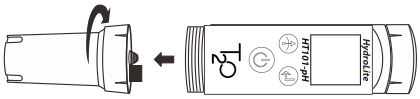
Electrode Care and Maintenance:

- For best results, always keep the pH electrode membrane wet.
- Ensure that the electrode is thoroughly washed with distilled water after each use.
- During extended periods of disuse, store the sensor with electrode storage solution. DO NOT use deionised or distilled water.

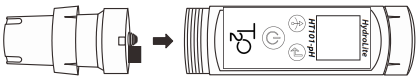
Electrode Replacement:

When the unit fails to calibrate or gives fluctuating readings for calibration standards, you need to replace the electrode module.

1. Twist the electrode collar counter clockwise, pull the old electrode module away from the unit.



2. Align the slot on the new electrode module, gently push the module into the unit.



3. Twist the electrode collar clockwise until it is tight. Installation is completed.

Replacing the Batteries:

If the battery indicator disappears during the use, the batteries require replacing.

1. Twist the electrode collar counter clockwise, pull the electrode module out from the unit.
2. Insert two “AAA” batteries into the battery compartment (note polarity).

3. Align the slot on the electrode module, push the electrode into the unit.
4. Twist the electrode collar clockwise until it is tight.

Troubleshooting

LCD DISPLAY	CAUSE	CORRECTIVE ACTION
- - -	Electrode dried out	Soak the electrode in 3M KCL solution or tap water for 10 minutes
	Measured value is out of range	Check whether the electrode membrane is clogged, dirty or broken
Err	Incorrect pH buffer solutions	Use fresh pH buffer solutions for calibration
	Electrode is broken	Replace the pH electrode module

Specifications

pH	Model	HL101
	Range	-1.00~15.00pH
	Accuracy	±0.01pH
	Resolution	0.01pH
	Calibration Points	1 to 3 points, USA (pH4.01/7.00/10.01) or NIST (pH4.01/6.86/9.18)
	Temperature Compensation	0~60°C, 32~140°F, Automatic
Temperature	Range	0~60°C, 32~140°F
	Accuracy	±1°C
	Resolution	0.1°C
	Calibration Range	Measured value ±10°C
Others	Hold Function	Manual or Automatic

	Power Off	Manual or Automatic (8 minutes after last key pressed)
	Sensor Type	Standard pH Electrode (Order Code: HL101ELEC)
	Power Requirements	2×1.5V "AAA" Batteries
	Dimensions	185(L)×40(Dia.)mm
	Weight	100g

Trace2o® Limited
The Technology Centre

Wagtech Court

Station Road

Thatcham, Berkshire, RG19 4HZ
Tel.: +44 (0)1635 566772

Fax: +44 (0)1635 873509

sales@Trace2o.com www.Trace2o.com

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Section 8:

HydroLite®

HL102

Pocket EC Tester

Instruction Manual

Introduction:

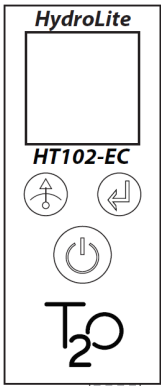
The HydroLite® HL102 is a pocket-sized conductivity (EC), TDS and temperature tester. This manual provides instructions on use, with a step-by-step operating guide, as well as care and maintenance instructions.

Components:

- HydroLite® HL102 pocket EC/TDS/temperature tester
- EC Calibration Solution (1413µS)

Keypad:

The HL102 pocket EC/TDS/temperature tester uses a simple three-button membrane keypad, with graphical symbols to describe the function of each key.

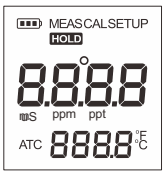


Map of keys and functions:

KEY	FUNCTION
On/Off Hold	• Powers the unit ON/OFF • Freezes the currently displayed value for recording; press the key again to resume measuring. • When in calibration mode, exits calibration and returns to measurement mode.
Cal	• Press the key to enter the calibration mode. • Press and hold the key to enter setup menu. • In the calibration mode, press the key to set calibration values. • In the setup mode, press the key to select default option.
Enter	• Confirms the calibration or selected option. • Toggles between conductivity, TDS and salinity measurement modes.

Display:

The unit is equipped with a clear LCD display that is used to show measured value, mode indicators and function indicators.

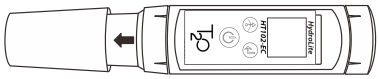


Map of mode indicators and descriptions:

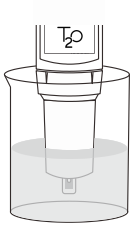
Mode indicator	Description
MEAS	Indicates unit is in the measurement mode
CAL	Indicates unit is in the calibration mode
SETUP	Indicates unit is in SETUP mode
HOLD	Indicates the measured value has been frozen
ATC	Indicates temperature compensation is enabled

Prior to Use:

- Remove the electrode protective cap from unit.



- Soak the electrode for a few minutes in tap water to remove dirt and oil stains on the electrode.



Power On/Off:

- Press ON/OFF key to turn on the unit, the display shows measured value.
- Press and hold the ON/OFF key for 5 seconds, the unit will turn off.
- If no key is pressed for 8 minutes, the unit will automatically turn off to conserve power.

Note: The auto-off function can be disabled if required – see below for further details

Setup Menu:

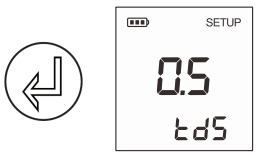
The HL102 pocket EC/TDS/temperature tester includes a comprehensive setup menu with customisable options to suit user measurement requirements.

PARAMETER	DESCRIPTION	OPTIONS	DESCRIPTION	DEFAULT
CAL	Calibration Point	1	1 point	●
		2	2 points	
		3	3 points	
tdS	TDS Factor	0.5	Setting Range: 0.1 to 1.0	0.5
UNIt	Temperature Unit	°C	Degrees Celsius	●
		°F	Degrees Fahrenheit	
°C	Temperature Calibration	CAL	Enters the temperature calibration mode	
HOLd	Auto-Hold	YES	Automatically freezes a stable reading	
		NO	Disable	●
OFF	Auto-Off	YES	Automatically turn off the unit	●
		NO	Disable	
rSt	Reset	YES	Restore factory settings	
		NO	Disable	●

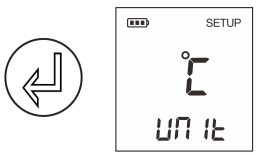
SETTING THE DEFAULT PARAMETERS:

1. Press and hold the CAL key for 3 seconds to enter setup menu; the display shows currently selected number of calibration points.

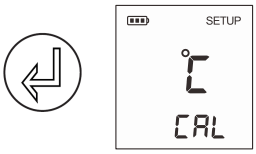
2. Press CAL key to select 1 or 2 or 3 point calibration. Press ENTER key to confirm; the unit goes to TDS factor setting mode, the display shows “0.5/TDS”.



3. Press CAL key to set the TDS conversion factor. Press ENTER key to confirm; the unit goes to temperature unit selection mode, the display shows “^{o}C/UNIT”.



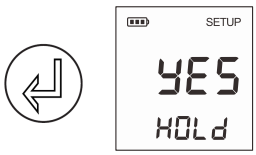
4. Press CAL key to select the temperature unit (ºC or ºF). Press ENTER key to confirm; the unit goes to temperature calibration mode, the display shows “ºC/CAL”.



5. If you do not want to perform temperature calibration, press ENTER key; the unit goes to next option.

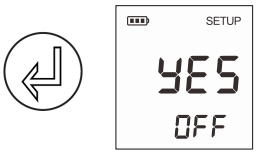
6. To perform temperature calibration, press CAL key to enter the temperature calibration mode, the display shows current temperature reading.

7. Press CAL key to set temperature value. Press ENTER key to confirm; the display shows “YES/HOLD” indicating that the auto-hold function is enabled.



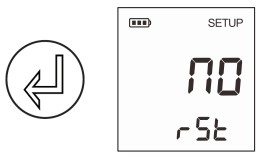
If the auto-hold function is enabled, the unit will automatically sense a stable endpoint reading and freeze the reading in the display. If you disable this function, the unit allows user to freeze the reading in the display manually by pressing the HOLD key.

8. Press CAL key to enable or disable the auto-hold function. Press ENTER key to confirm; the display shows “YES/OFF” indicating that the auto-off function is enabled.



When the auto-off function is enabled, if no key is pressed for 8 minutes, the unit will automatically turn off to conserve power.

9. Press CAL key to enable or disable the auto-off function. Press ENTER key to confirm; the display shows “NO/RST” indicating the current status of the reset function.



WARNING:

The Reset function will restore the unit back to factory default settings, all calibration values and selected parameters will be reset.

10. Press CAL key to enable or disable the reset function. Press ENTER key to confirm, the unit returns to measurement mode. Setting is completed.

EXIT THE SETUP MENU:

During the setup mode, to exit the setup menu, press ON/OFF key; the unit will return to measurement mode immediately.

Conductivity Calibration

The HL102 pocket EC/TDS/temperature tester allows up to 3 point calibration in the conductivity mode. To ensure higher accuracy, we recommend that you perform a 3 point calibration, or select a calibration standard concentration close to the sample value you are measuring. For typical environmental freshwater samples, 1413µS/cm should be sufficient. The unit will automatically detect these conductivity standard solutions and prompt the user to calibrate the meter. When the calibration is done, all new calibration values will automatically override existing data. The following table shows acceptable conductivity ranges of calibration solution for each measuring range.

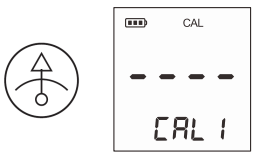
MEASURING RANGE	CALIBRATION SOLUTION RANGE	DEFAULT
0~20µS/cm	7~17µS/cm	10µS/cm
20~200µS/cm	70~170µS/cm	84µS/cm
200~2000µS/cm	700~1700µS/cm	1413µS/cm
2~20mS/cm	7~17mS/cm	12.88mS/cm

Ensure that you use fresh conductivity standard solution during the calibration. Do not reuse calibration solutions as it may be contaminated and affect the calibration and accuracy of measurement.

SINGLE POINT CALIBRATION:

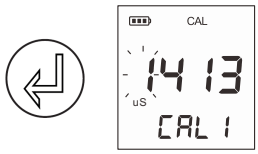
1.1 Rinse the conductivity electrode with distilled water, then rinse with a small amount of calibration solution.

1.2 Press CAL key; the unit enters calibration mode.

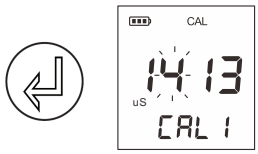


1.3 Immerse the conductivity electrode in the calibration solution; the unit immediately displays current calibration standard (e.g., 1413µS/cm).

1.4 Press ENTER key; the default calibration value begins flashing.



1.5 Press CAL key to set each digit, press ENTER key to confirm. When the setting is done, ensure the displayed value matches the chosen calibration standard.



1.6 Press ENTER key to start the calibration. Wait for the reading to stabilise; the display shows “END”. The unit returns to measurement mode automatically. Single point calibration is completed.

2 POINT CALIBRATION:

2.1 Ensure that 2 point calibration is selected in the setup menu.

2.2 Repeat steps 1.2 to 1.6 above; when the first calibration point is done, the display will show “CAL2”. The unit prompts you to continue with second point calibration.

2.3 Immerse the conductivity electrode in the calibration solution, the unit automatically shows current calibration standard (e.g., 84µS/cm).

2.4 Press ENTER key; the default calibration value begins flashing.

2.5 Press CAL key to set each digit, press ENTER key to confirm. When the setting is done, ensure the displayed value matches the chosen calibration standard.

2.6 Press ENTER key to start the calibration. Wait for the reading to stabilise; the display shows “END”. The unit returns to measurement mode. Second point calibration is completed.

3 POINT CALIBRATION:

3.1 If 3 point calibration is selected in the setup menu, when second calibration point is done, the display will immediately show “CAL3”. The unit prompts to continue with third point calibration.

3.2 Repeat the above steps until the display shows “END”, the unit returns to measurement mode. Calibration is completed.

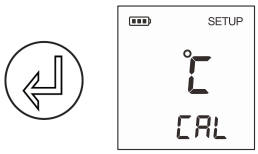
Note: Performing the conductivity calibration will simultaneously calibrate the corresponding TDS and salinity values.

Temperature Calibration

During the measurement, if the temperature reading displayed differs from that of an accurate thermometer, you need to calibrate the unit.

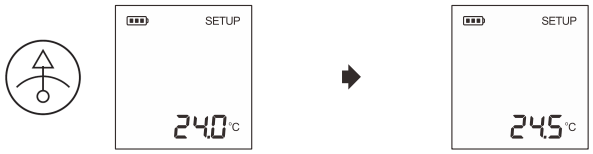
1. Press and hold the CAL key for 3 seconds to enter setup menu.

2. Press ENTER key until unit shows the “^{o}C/CAL” or “^{o}F/CAL”.



3. Press CAL key to enter the temperature calibration mode.

4. Press CAL key again to set temperature value (Resolution: 0.5^{o}C).



5. Press ENTER key to confirm, the display shows next option.

6. Press ON/OFF key, the unit returns to measurement mode. Calibration is completed.

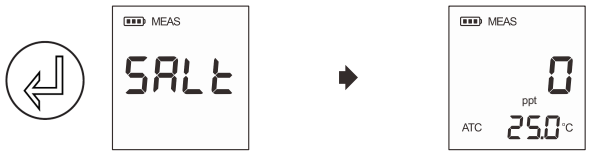
EXIT THE CALIBRATION:

During the calibration process, if you want to exit the calibration, press ON/OFF key, the unit will return to measurement mode.

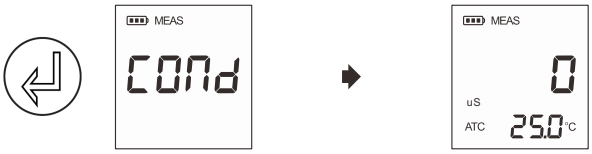
Switching Measurement Mode:

1. In the conductivity mode, press ENTER key until the display shows “TDS”. The unit enters TDS measurement mode.

2. Press ENTER key, the unit enters the salinity measurement mode.



3. Press ENTER key again, the unit returns to conductivity measurement mode.

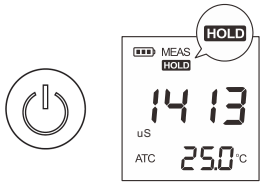


Measurement:

Rinse the conductivity electrode with distilled water. Immerse the electrode into the sample solution. Stir the solution gently. Wait for the reading to stabilise; record the measured value as displayed.

Hold Function:

The HL102 pocket EC/TDS/temperature tester contains two data hold modes. When the Auto-Hold function is enabled, the unit will automatically sense a stable endpoint reading and freeze it; the “HOLD” indicator appears on the display. If the Auto-Hold function is disabled, press HOLD key, the unit will immediately freeze the currently displayed value. Press the HOLD key again to resume measuring.



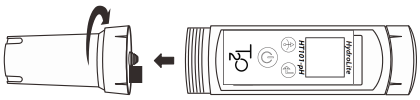
Electrode Care and Maintenance

- After each use, the conductivity electrode should be rinsed thoroughly in deionised water.
- If there is a build-up of solids inside the measurement area of the cell, these should be removed very carefully with a cotton bud soaked in solvent, taking care not to touch the metal parts of the inner cell.

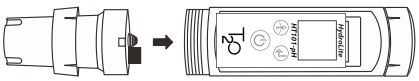
Electrode Replacement:

When the unit fails to calibrate or gives fluctuating readings for calibration standards, you need to replace the electrode module.

1. Twist the electrode collar counter clockwise, pull the old electrode module away from the unit.



2. Align the slot on the new electrode module, gently push the module into the unit.



3. Twist the electrode collar clockwise until it is tight. Installation is completed.

Replacing the Batteries:

If the battery indicator disappears during the use, the batteries require replacing.

1. Twist the electrode collar counter clockwise, pull the electrode module out from the unit.
2. Insert two “AAA” batteries into the battery compartment (note polarity).

3. Align the slot on the electrode module, push the electrode into the unit.
4. Twist the electrode collar clockwise until it is tight.

Troubleshooting

LCD DISPLAY	CAUSE	CORRECTIVE ACTION
- - -	Electrode dried out	Soak the conductivity electrode in tap water for 10 minutes
	Measured value is out of range	Check the electrode whether clogged, dirty or broken
Err	Incorrect calibration solutions	Using the fresh conductivity standard solutions for calibration
	Setting value does not match calibration solution	Reset the calibration value
	Electrode is broken	Replace the electrode module

Specifications

Conductivity	Model	HL102
	Range	0~20.00, 200.0, 2000μS/cm, 20.00mS/cm
	Accuracy	±1% F.S
	Resolution	0.01, 0.1, 1
	Calibration Points	1 to 3 points
	Calibration Solutions	10μS/cm, 84μS/cm, 1413μS/cm, 12.88mS/cm
TDS	Range	0~10 parts per thousand (Max. 20 parts per thousand, depending on factor setting)
	Accuracy	±1% F.S
	TDS Factor	0.1~1.0 (Default 0.5)
Salinity	Range	0~10 parts per thousand
	Accuracy	±1% F.S
	Resolution	0.01 parts per thousand
Temperature	Range	0~60°C, 32~140°F
	Accuracy	±1°C
	Resolution	0.1°C, 0.1°F
	Calibration Points	1 point
	Calibration Range	Measured value ±10°C
Others	Temperature Compensation	0~60°C, 32~140°F
	Temperature Coefficient	2%/°C
	Cell Constant	K=1
	Normalization Temperature	25°C
	Hold Function	Manual or Automatic

	Power Off	Manual or Automatic (8 minutes after last key pressed)
	Sensor Type	Order Code: HL102ELEC
	Power Requirements	2×1.5V "AAA" Batteries
	Dimensions	185(L)×40(Dia.)mm
	Weight	100g

Calculation of TDS conversion factor:

To determine the TDS conversion factor use the following formula:

$$\text{Factor} = \frac{\text{Actual TDS}}{\text{Actual Conductivity @ 25ºC}}$$

Where:

Actual TDS: value from the high purity water and precisely weighed NaCl or KCL reagent.

Actual Conductivity: the measured conductivity value.

For example:

Dissolve 64 grams of potassium chloride reagent in 1L distilled water. If its conductivity value is 100mS/cm, then TDS conversion factor is 0.64.

Trace2o® Limited

The Technology Centre

Wagtech Court

Station Road

Thatcham, Berkshire, RG19 4HZ Tel.: +44 (0)1635 566772

Fax: +44 (0)1635 873509

sales@Trace2o.com
www.Trace2o.com

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