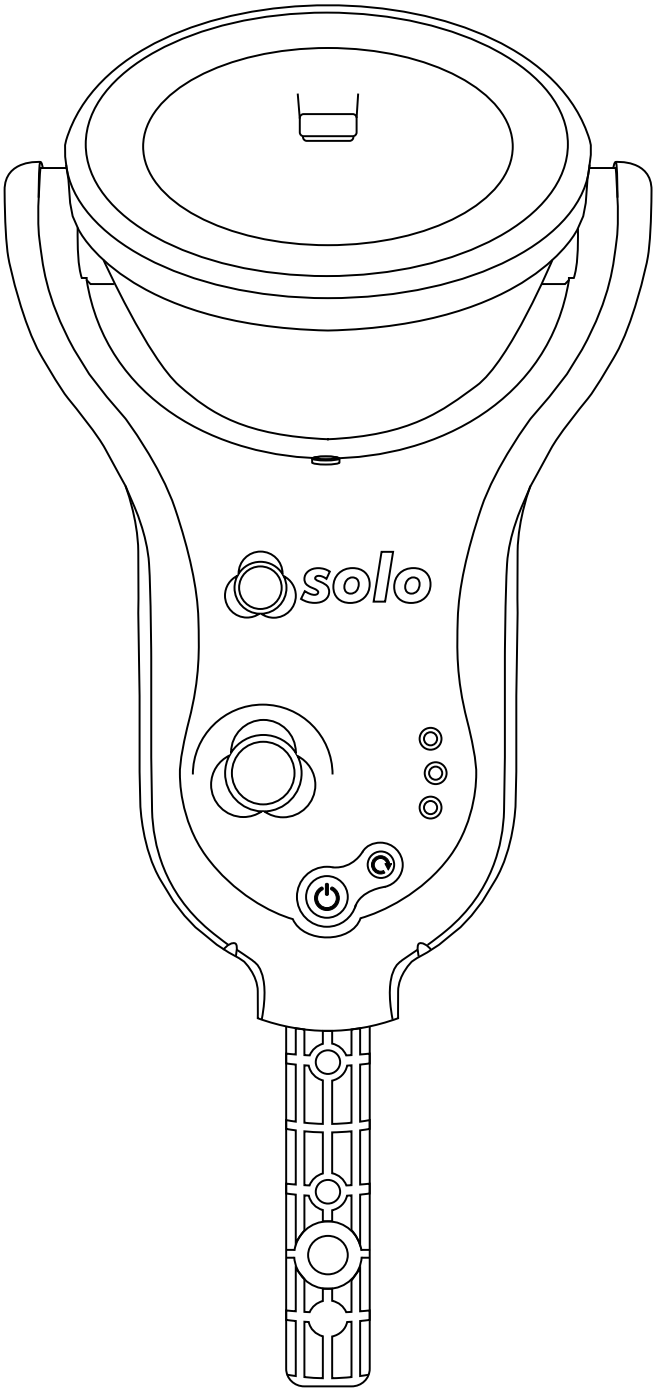
solo™ 365

User Manual

www.sdifire.com



Warning

This product is intended to be used at height.
Exercise great care and always wear appropriate PPE (personal protective equipment) when operating above head height in order to avoid the risk of injury.
DO NOT OVER REACH. Keep proper footing and balance at all times. Proper footing and balance enables better control of the equipment in unexpected situations.
Pay particular attention to avoid overhead objects such as light fittings, overhead power cables, or any objects that could be accidentally dislodged which might cause danger to the operator or anyone else in the vicinity.
Avoid prolonged, direct exposure to the vapor generated by Solo 365. Safety Data Sheets for the Solo 370 battery pack and Solo ES6 Smoke Cartridge are available. It is recommended to review the safety data sheets for Solo 370 Battery Pack and Solo ES6 Smoke Cartridge before use (see www.sdifire.com/support).

Warning

This product contains hot parts.
DO NOT TOUCH the heat element. It may be very hot immediately after use and may burn if touched.

Caution

Contains Lithium Ion rechargeable batteries:

- Do not dismantle, open, shred or incinerate batteries.
- Do not expose batteries to heat or fire. Avoid storage in direct sunlight.
- Do not short-circuit a battery. Do not store batteries loose in a box or drawer where they may short-circuit each other or be short-circuited by other metal objects.
- Do not subject batteries to mechanical shock.
- Keep batteries clean and dry.
- Do not use any charger other than that specifically provided for use with the equipment. Refer to the manufacturer's instructions or equipment manual for proper charging instructions.
- Do not leave a battery on prolonged charge when not in use.
- Do not use any battery which is not designed for use with this equipment.
- Do not use the battery in any other application.
- Keep batteries out of the reach of children.
- Dispose of properly.

Warning

Contains precision parts which may be easily damaged and cause injury. **DO NOT TOUCH** the smoke fluid intake pipe in the smoke cartridge area.

Important Information

- Read this User Manual completely before using your Solo 365.
- Keep this User Manual - Save all safety and operational instructions for future reference.
- Take note of the Warnings - Read carefully and follow all warning labels on the product and those described in this User Manual.
- Solo 365 is electronic test equipment and care should be taken when handling and storing. Dropping the unit on to a hard surface could damage it. Please look after it, treat it with care for lasting use.
- This product is designed for indoor use only and should not be subject to harsh environments. It is not designed for use in hazardous areas (those containing explosive vapour or dust). Do not use the equipment in places where temperatures and/or humidity are high or go through rapid changes including:

  - Direct sunlight
  - Near heat sources (stoves, radiators, etc.)
  - Sandy or dusty environments
  - In the presence of strong magnetic fields
  - Places prone to strong vibration
  - Restrictions detailed in the Technical Information (see Section 10.2).

- Solo 365 may be used in ceiling and floor voids but care must be taken to ensure that the unit and cup can pass through gaps in both directions.
- Stop using Solo 365 immediately if you notice any damage or unusual odors, liquids or sounds coming from the unit. Turn the power off immediately and consult technical support and troubleshooting (Section 8 onwards).
- Use only approved accessories as described in this manual that are recommended by the manufacturer for your Solo 365.
- Do not use your Solo 365 if it is not operating correctly (see fault finding guides) and consult Troubleshooting (Section 9) of this manual. If required seek technical advice (Section 10).
- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired and warranty invalidated.

Symbols

The following symbols are used throughout this User Manual and on the product.

This symbol on the product indicates that there is a safety hazard or an operation requiring care to avoid damage to the product or environment. You must read the appropriate sections of the User Manual to understand the nature and severity of all the potential hazards present and the action you must take.

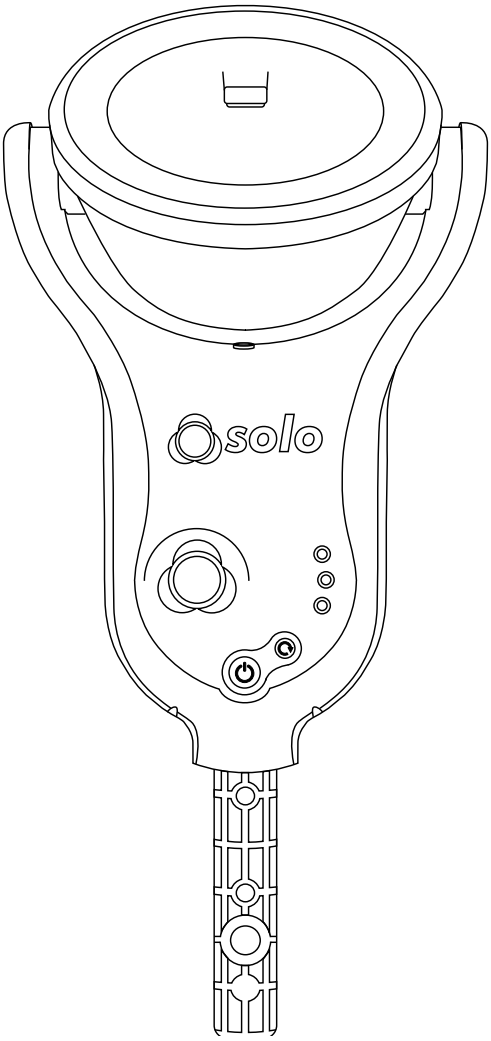
This symbol on the product warns you of hot surfaces or heat by convection.

This symbol on the product indicates that you should read and understand this User Manual before using this product.

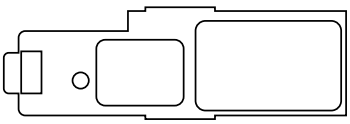
This symbol on the product indicates that this part of the device is susceptible to static damage.

Kit Contents

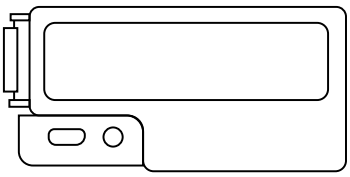
Solo 365 Electronic Smoke Detector Tester Kit containing:



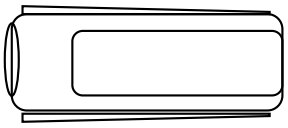
Solo 365 Head Unit x 1



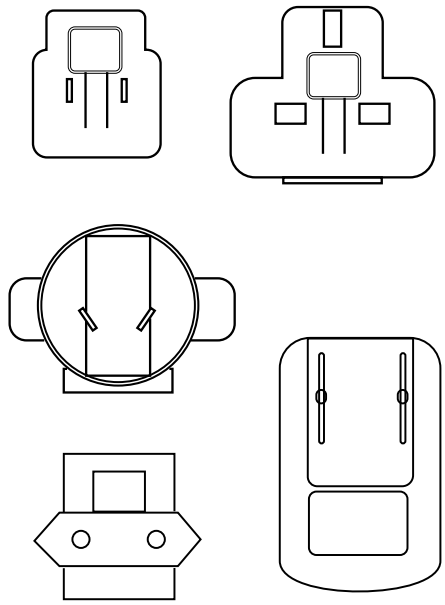
Solo 371 Smoke Generator x 1



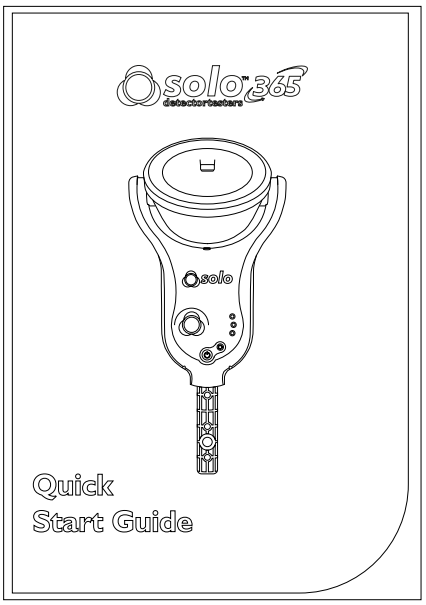
Solo 370 Lithium Ion Battery Pack x 1



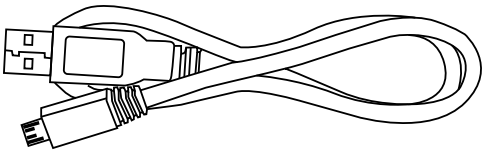
Solo ES6 Smoke Cartridge x 1



Solo 365 Universal USB Charger x1



Quick Start Guide x1



USB Lead x1

Product Registration Card x1

Contents
Table

1 General Instructions

1.1 Warranty
In addition to any other express warranty given in writing by the Company in relation to the Goods, the Company warrants that the Goods supplied under these terms and conditions will be in accordance with the specification (if any) contained in the Purchase Order, and will be free from defects in workmanship and material for a period of 18 months from the date of delivery to the Buyer or for a period of 12 months after the date of sale by the Buyer to the final customer whichever period is the shorter.

1.2 Acknowledgement
Solo™ is a registered trade mark of SDi. All other brand names mentioned are trademarks or registered marks of their respective holders, and are hereby acknowledged.

1.3 Recycling
The packaging can be easily separated into the following materials:

- Cardboard (outer box)
- Cardboard (inner buffers, boxes)
- Polyethylene
- Plastic

Please dispose in line with local environmental requirements.

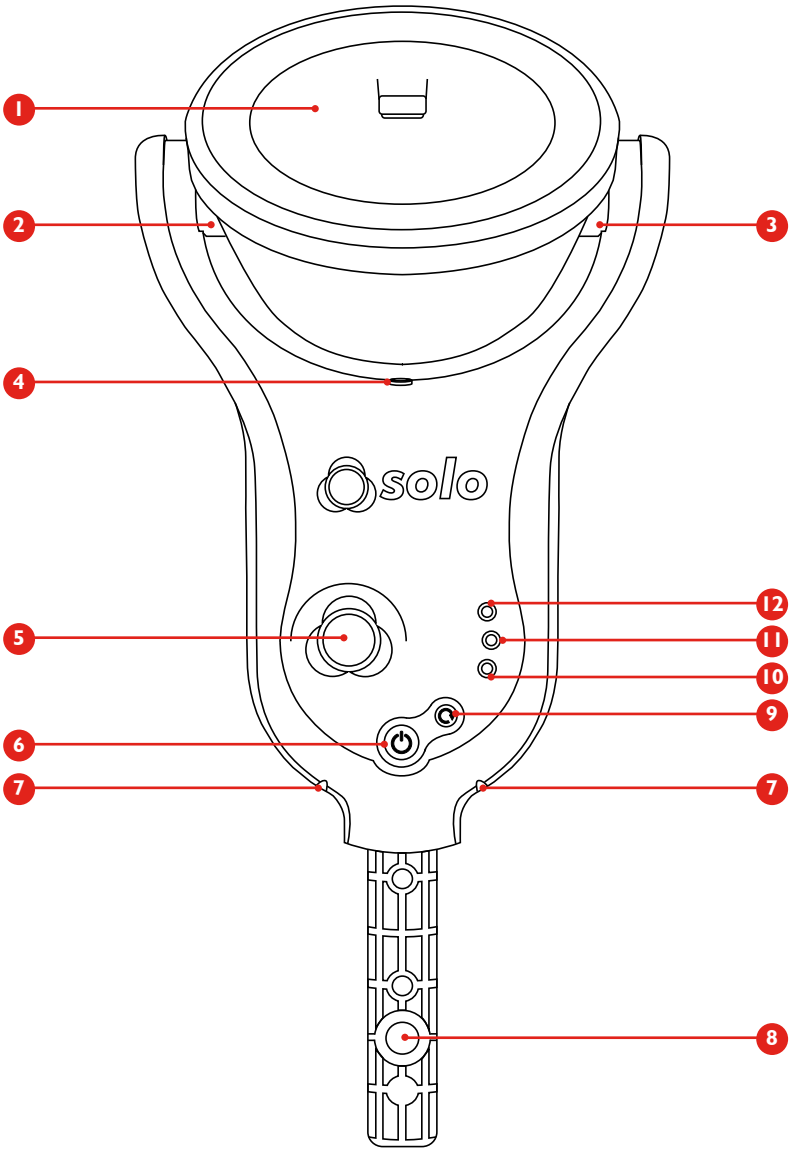
2 Solo 365
Introduction

Thank you for purchasing the Solo 365 Smoke Detector Tester.
This manual is designed to assist you to get the best and most efficient use of the Solo 365 and provides all the information required to perform routine service and maintenance tasks with ease.

Solo 365 includes advanced technology that simplifies functional testing of smoke detectors in the field.

Design Features

1. Clear cup
2. Smoke outlet
3. Proximity sensor
4. Automatic LED light
5. Air inlet
6. Power button
7. Status indicator LEDs
8. Locking button
9. Function button
10. Generator status LED
11. Cartridge status LED
12. Battery status LED



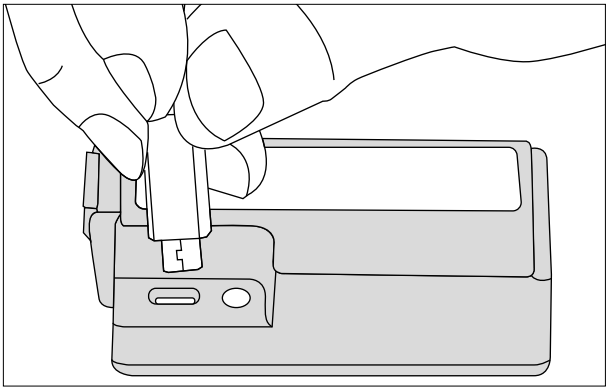
3 Preparation
For First Use

Prior to first use:
Check contents provided. **Do not** charge the battery while it is fitted in the unit. Take care during installation of the product components not to touch exposed electrical contacts. Ensure that all components are securely fitted. When replacing consumables, ensure that the unit is switched off before opening back cover.

3.1 Charging the Battery
The battery is charged by connecting the battery pack to the powered USB socket using the supplied mains adaptor.

- Ensure the battery is fully charged before use.
- Do not charge the battery outside of the specified operating temperature range (40-115°F).
- At low ambient temperatures (40-50°F), the battery may not charge completely but may continue to indicate that charging is in progress.
- If the battery pack detects that the temperature is outside of the operational temperature range for charging, a fault will be indicated by a red flashing LED.
- In the event of a battery charging fault, disconnect the charger, ensure the battery is within the operational temperature range and retry charging the battery.

Warning
Read the cautions on Lithium Ion rechargeable batteries before use (see Page 2).

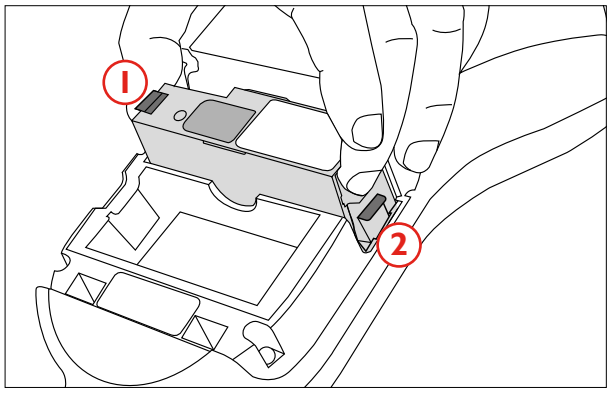


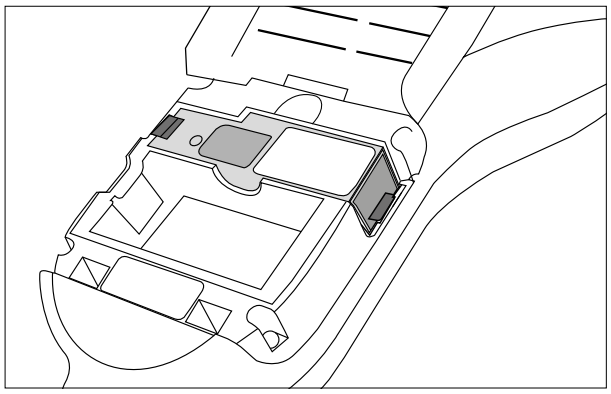
Battery LED:

- Flashing Red/Green: Detecting level of charge
- Solid Red: Charging
- Solid Green: Fully charged
- Flashing Red: Fault

3.2 Installing the Generator
- Open the back cover
- Remove protective packaging of generator. **Do not touch** exposed electrical contacts.
- Insert generator firmly into recess, engaging clips 1 and 2 (see Fig. 1).
- Once the generator is inserted do not remove it until indicated that a replacement is necessary.
- When replacing a generator, any dust or debris within the Solo 365 housing can be removed using an air duster. Any condensation can be removed by wiping with a lint-free cloth

Figure 1





Generator

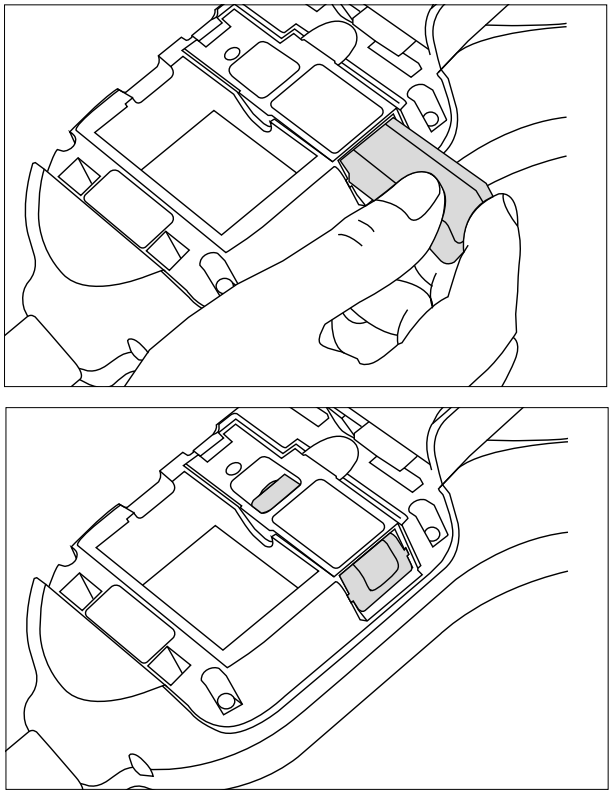
- Flashing Red: Consumable low
- Solid Red: Consumable empty

3.3 Inserting the Smoke Cartridge

- Remove cartridge from bag.
- Do not insert smoke cartridge until generator has been fully fitted into the main unit. See installing the Generator section 3.2 (Page 9).
- Slide cartridge completely into generator housing following the guide rails (Fig. 2).
- Once the cartridge is inserted into the generator do not remove it until indicated that a replacement is necessary. **Do not re-use** old cartridges.

Do Not Touch
Do not touch the contacts on the PCB on the cartridge. Static electricity may cause damage and contamination of the contacts must be avoided.

Figure 2



If you have difficulty inserting the cartridge please push it fully into place and hold for 3-5 seconds

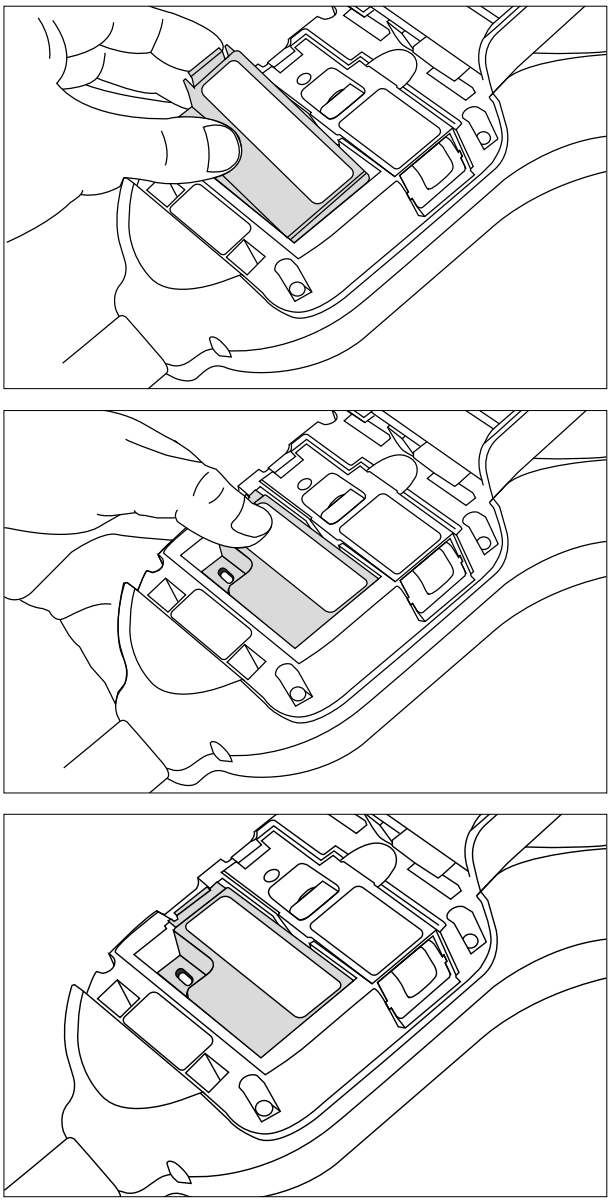
Cartridge
Flashing Red: Consumable low
Solid Red: Consumable empty

3.4 Inserting the Battery

- Once the battery is charged clip the battery pack into the battery compartment. (Fig. 3).
- Do not force the battery into place.
- Close the back cover.

Do Not Touch
Do not touch the contacts on the battery. Static electricity may cause damage and contamination of the contacts must be avoided.

Figure 3



Battery
Flashing Red: Consumable low
Solid Red: Consumable empty

4 Using
Solo 365

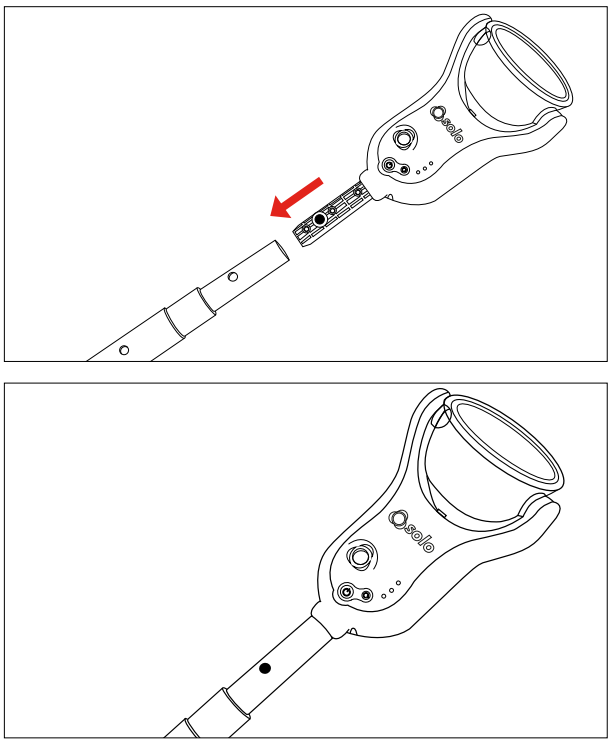
- Do not block air vents during use.
- Use only cartridges and batteries specified by the manufacturer.

4.1 Attaching Solo 365 to Solo Access Poles

Solo 365 is designed for use with the Solo range of access poles. (purchased separately). The product is not compatible with alternative access poles.

- Take the Solo access pole and press down the locking button on Solo 365. Align it with the location hole and push the Solo 365 handle further into the pole until the button springs up through the hole. Twist to lock. (Fig. 4)

Figure 4



Caution

No more than 3 Solo 101 extension poles should be used at the same time.

Warning

When working at height it is recommended that a competent person carries out a suitable risk assessment. This will identify any risk to the user and/or the environment and hence any need for Personal Protective Equipment.

NOTE: A Solo 101 extension pole can extend the Solo 100 and 108 telescopic poles, or may be used separately.

4.2 Powering on Solo 365

With the generator, cartridge and battery securely dettfi and the back covered closed, the unit can now be powered on. Power the unit on by holding down the power button for 3 seconds.

NOTE: After replacing a generator and powering on, a 'purge cycle' will run. During this the sound of the pump operating may be heard. This will last for approximately a few seconds after which, the unit will be ready for use. If smoke is not observed during a test a manual purge may be required (See section 4.8 Page 13).

The unit is functioning correctly if the status indicators are flashing green slowly. If the status indicators are not flashing green consult the indicator LED section (Page 12).

NOTE: If Solo 365 has been left unused for a period of time then a manual purge may be required (Section 4.8 Page 13).

4.3 Carrying Out a Simple Test

Smoke generation will begin automatically once the smoke detector enters the cup.

1) Raise Solo 365 up to the detector to be tested
2) Status indicator LEDs will flash fast blue once the detector enters the cup
3) Detector will enter alarm once sufficient smoke has been generated
4) Lower Solo 365
5) Status indicator LEDs will flash green

NOTE: For the best results the detector should be fully within the cup. Solo 365 may be used in ceiling voids and floor voids provided the detectors can be accessed safely. The unit should not be forced through narrow gaps. If the unit will not pass through a gap easily with the cup orientated 90° to the normal position there is a possibility it could become trapped.

Power On

Carefully place Solo 365 over the detector and ensure that the detector is central in the cup.

Testing:

Main status indicators flash fast Blue*

Smoke is generated and if the detector is functional it will be activated.

Test Finish:

Main status indicators flash fast Green*

Carefully place Solo 365 over the detector and ensure that the detector is central in the cup.

Clearing:

Main status indicators flash fast White*

Clearing blows air into the detector to remove smoke. This operation does not clean the internal parts of the detector. Once detector is cleared lower Solo 365.

***After 2 minutes of testing or clearing, Solo 365 will timeout indicated by alternate Green/Red flashing status indicator LEDs. Exit timeout by lowering Solo 365.**

4.4 LED Indicator Reference Chart

Status Indicator LEDs
Solo 365 indicates events as follows:

When Idle:

- Slow flashing Green: Power on
- Solid Purple: System fault
- Flashing Orange: Delayed start
- Slow flashing Red: Consumable low
- Solid Red: Consumable empty

When Active:

- Fast flashing Blue: Testing normally
- Fast flashing Green: Clearing ready
- Fast flashing White: Clearing mode
- Slow flashing Red/Green: Timeout in testing or clearing modes
- Fast flashing Red: Consumable low

Torch LED

- Solid White: LED auto torch

Consumable LEDs

Solo 365 has three additional LEDs to show the status of the battery, smoke cartridge and the smoke generator. Warnings are indicated as follows:

Battery **Cartridge** **Generator**

- Flashing Red: Consumable low
- Solid Red: Consumable empty

4.5 Delayed Start

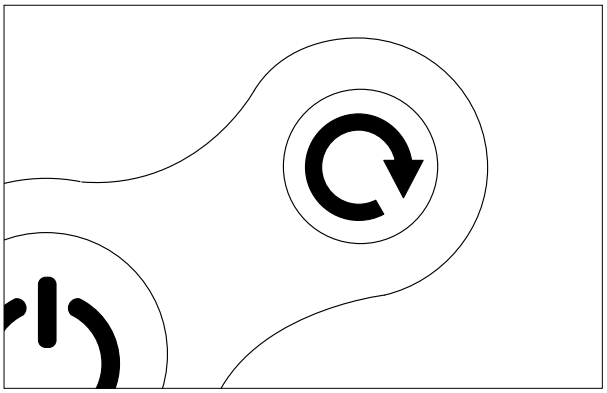
On occasion it may be necessary to test detectors that do not easily fit into the Solo 365 smoke cup or are obstructed in some way. To allow testing of such detectors or aspirating smoke detection systems, Solo 365 has the facility to allow a 20 second delayed start of a test.

- This feature can be activated by pressing the function button on the front of the unit (Fig. 5) momentarily (< 1 second). The status indicators will flash orange for 20 seconds allowing time to reach the detectors/aspirating pipes.

- The status indicator LEDs will flash fast blue indicating smoke generation for 20 seconds during which time Solo 365 should be in proximity to the detector and/or aspirating sample point.

- After 20 seconds of smoke generation the unit returns to idle state and the status indicator flashes slow green.

Figure 5



4.6 Clearing a Detector

Once activated any lingering smoke can be cleared from the detector using the 'Clearing mode'. Air is blown around the detector – clearing any lingering smoke via the vent in the cup.

1) After the detector activates lower Solo 365 so the detector is clear from the cup

2) The Status Indicator LEDs will flash fast green

3) Raise the unit over the detector again whilst the status indicator LEDs are flashing fast green

4) The Status Indicator LEDs will flash fast white – indicating clearing mode

After clearing, the unit will return to idle state ready for the next test.

NOTE: Clearing mode is not available when using the delayed start feature.

4.7 Using the LED Torch

In low light levels an LED torch will automatically illuminate from underneath the cup. This makes for easy alignment and testing of detectors in dark environments.

Upon alignment and the starting of the test the LED torch will switch off allowing a clear view of the detector LED through the cup.

4.8 Manual Purge

A manual purge may be required when the unit has not been used for a period of time, when in cold conditions, a new generator has been installed or in the case of a significant drop in performance. A manual purge should be carried out in a well ventilated area as follows:

1) Hold down the function button continuously, during this time Solo 365 will attempt to generate smoke

2) When smoke has been observed for approximately five seconds release the function button

3) Solo 365 will return to idle state – ready for normal use

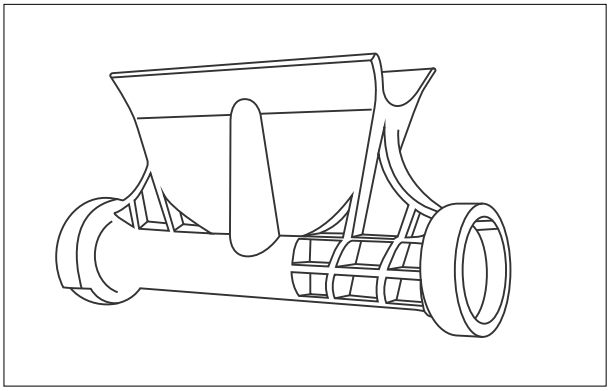
5 ASD Adaptor *(Available Separately)*
Testing ASD Systems

5.1 Testing an ASD System

An ASD System can be tested by using the 'Delayed Start Mode' and replacing the cup with the Solo 365 ASD Adaptor (Product Code: Solo 372-001). (Fig. 6)

> Users should note that using the Solo365 in this configuration is outside the scope of the UL classification for Solo365. The application has been thoroughly tested independently with all ASD technologies.

Figure 6



5.2 Installing the ASD Adaptor

1) Ensure Solo 365 is powered off

2) With Solo 365 facing you, remove the cup by aligning the notch on the left hand side arm and disengage by squeezing the cup and gently easing the cup away from the arm (Fig. 7)

3) Rotate the cup to free it from the other arm (Fig. 8)

Figure 7

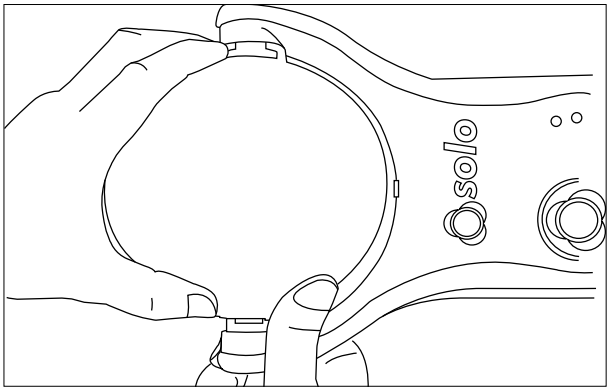
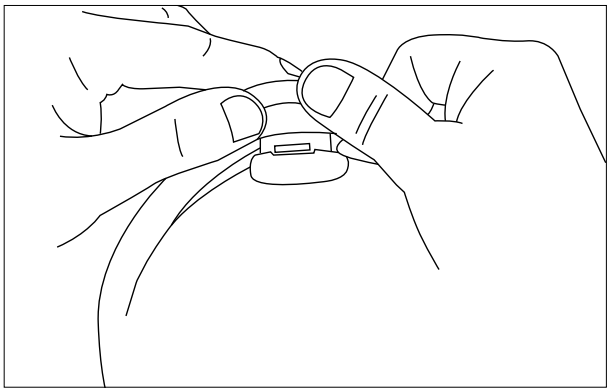
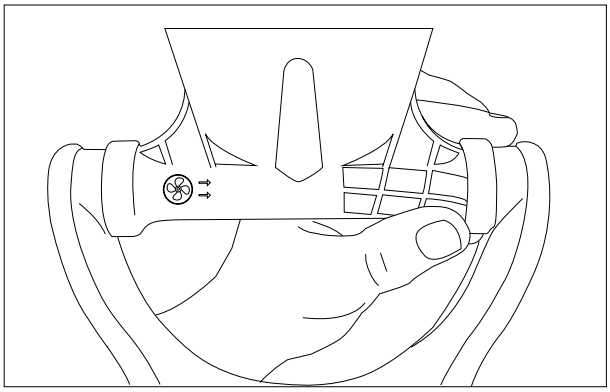


Figure 8



4) Fit the ASD adaptor by locating into both arms. Ensure that the fan symbol is located on the side of the unit where smoke is emitted. (LHS when unit is facing the user). (Fig. 9)

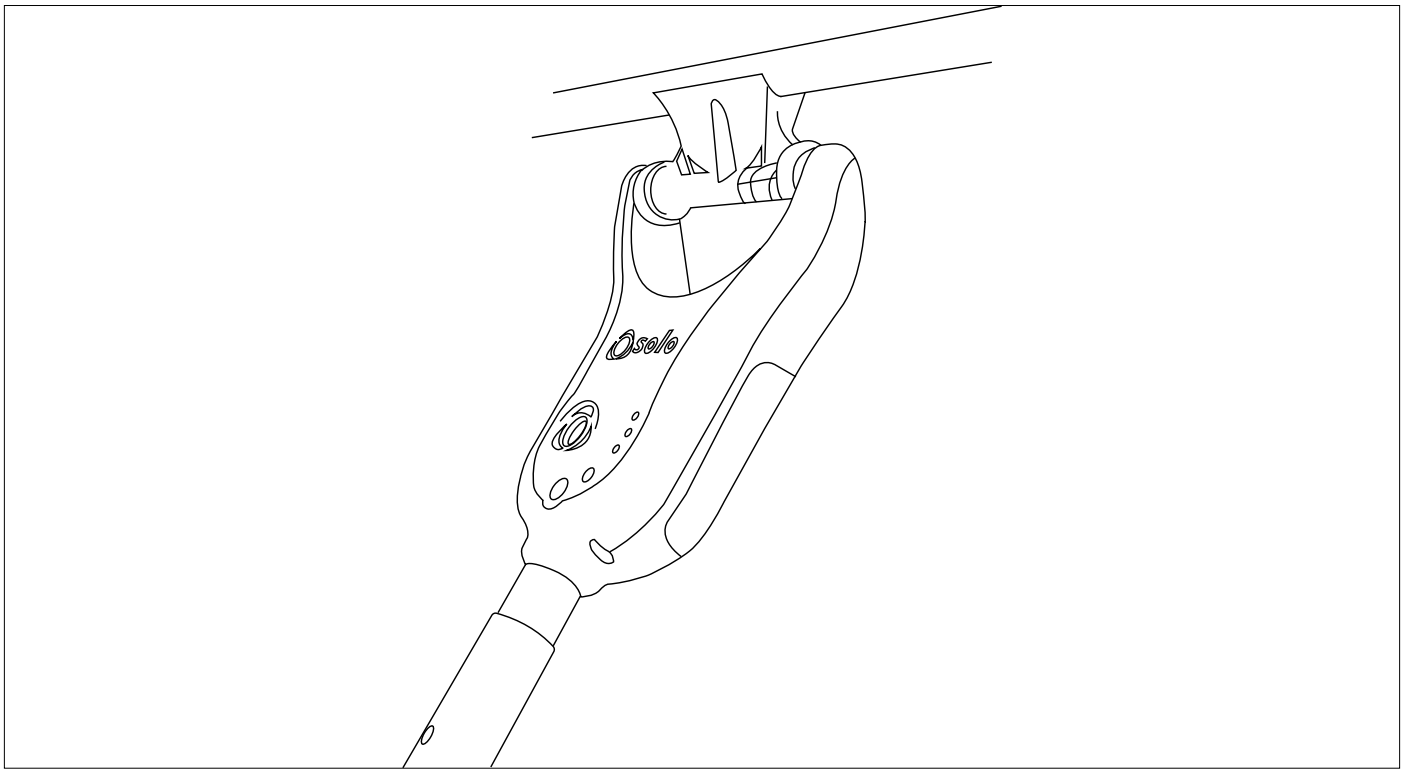
Figure 9



5.3 Testing with the ASD Adaptor

5) Power Solo 365 on
6) Select the 'Delayed Start Mode' by pressing the 'function button' for one second – the status LEDs will flash orange
7) Within 20 seconds ensure Solo365 is located over the sampling hole on the aspirating pipe to carry out the test (Fig. 10)
8) Smoke will automatically be generated for 20 seconds indicated by the status LEDs flashing blue

Figure 10



6 Removing & Replacing Consumables

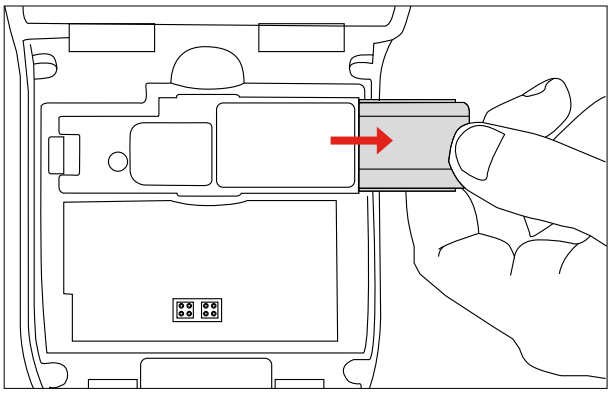
All critical parts of Solo 365 can be replaced in the field without having to return the unit for service. Ensure that the unit is switched off during the replacement of consumables. Do not touch electrical contacts.

6.1 Removing the Smoke Cartridge

1) Ensure the unit is switched off and open the back cover

2) Remove the smoke cartridge from the generator by placing your thumb in the recess and sliding the cartridge along the guide rails (Fig. 11). (Do not remove the generator).

Figure 11



6.2 Replacing the Smoke Cartridge

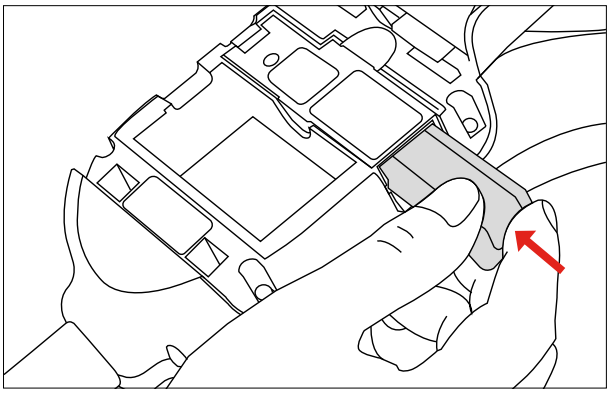
1) Remove the cartridge from the bag

2) Slide cartridge completely into generator housing following the guide rails (Fiig. 12)

3) Once the cartridge is inserted into the generator do not remove it until indicated that a replacement is necessary.

NOTE: Do not re-use empty cartridges.

Figure 12



Do Not Touch

Do not touch the contacts on the cartridge. Static electricity may cause damage and contamination of the contacts must be avoided.

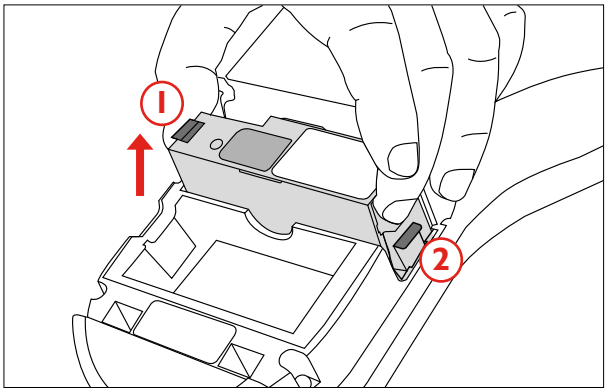
6.3 Removing the Smoke Generator

1) Ensure the unit is switched off and the Smoke Cartridge is removed (Section 6.1)

2) Disengage clip '1' and lift. Repeat for clip '2' to remove the used generator (Fig. 13)

NOTE: When replacing the generator, any dust or debris within the housing can be removed using an air duster. Any condensation can be removed by wiping with a lint-free cloth.

Figure 13

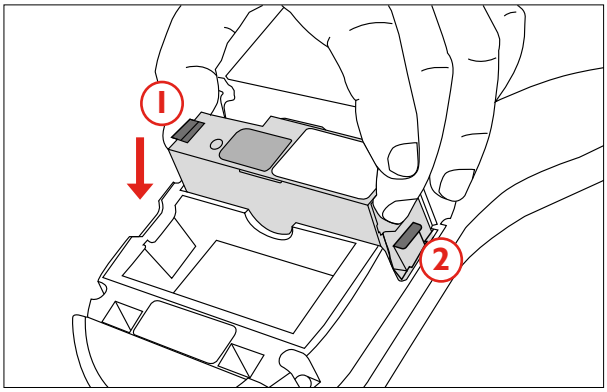


6.4 Replacing the Smoke Generator

1) Insert the generator firmly into the recess, engaging clips '1' and '2' (Fig. 14)

NOTE: Once the generator is inserted do not remove it until it is indicated that a replacement is necessary.

Figure 14



Do Not Touch

Do not touch the contacts on the generator. Static electricity may cause damage and contamination of the contacts must be avoided.

6.5 Removing the Battery for Charging

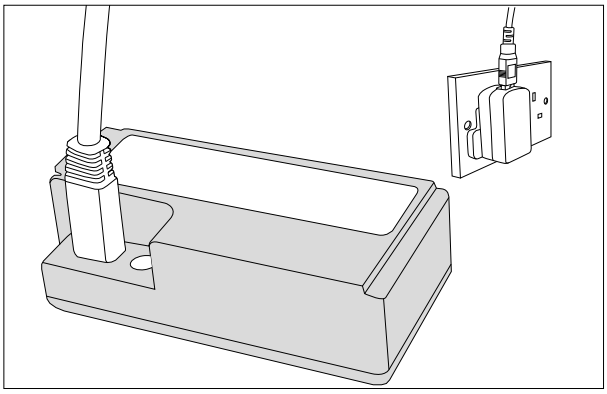
1) Ensure the unit is switched off and open the back cover.

2) Unclip and remove the battery

3) Charge the battery by connecting the USB lead to the battery and the powered USB socket using the supplied mains adaptor or suitable source (minimum 1Amp) (Fig. 15)

NOTE: Do not charge the battery while it is fitted in the unit.

Figure 15

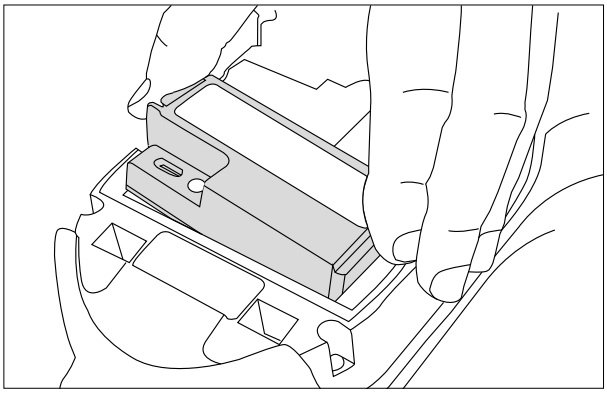


6.6 Replacing the Battery

1) Once the battery is charged clip into the battery compartment and close the back cover (Fig. 16)

NOTE: Do not force the battery into place.

Figure 16



Do Not Touch

Do not touch the contacts on the battery. Static electricity may cause damage and contamination of the contacts must be avoided.

7 Consumables & Accessories

Consumables	
ES6-6 PACK-024	Solo 365 Smoke Cartridges x 6
SOLO370-1 PACK-024	Solo 365 Lithium Ion Battery Pack x1
SOLO371-024	Solo 365 Smoke Generator
SERVICE360-024	Solo 365 Service Pack containing: Spare 1058 x 1, Solo 370 x 1 & Solo 371 x 1

Accessories	
SOLO372-024	Solo 365 ASD Adaptor

Spares	
SPARE1058-024	Clear Cup & Membrane for Solo 365
SPARE1059-024	Membrane for Solo 365
SPARE1060-024	Solo Charger & USB Lead

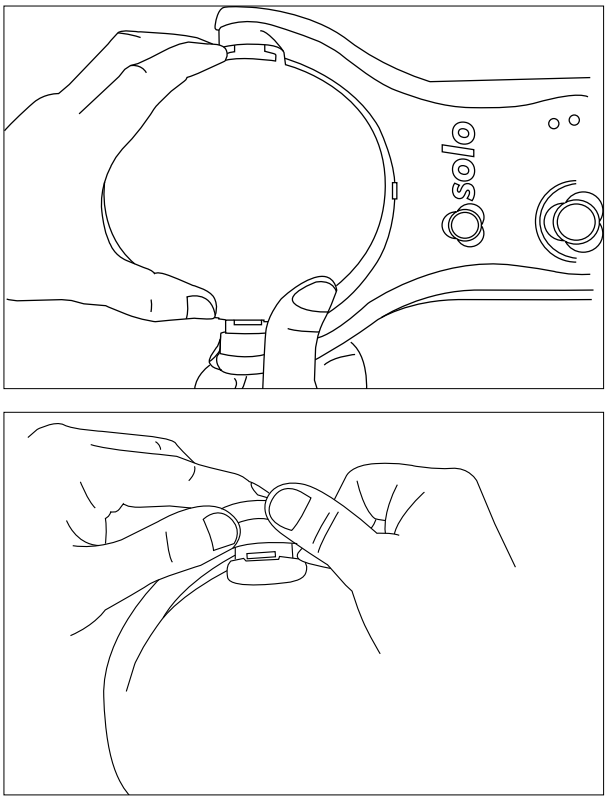
8 Spares

8.1 Removing the Clear Cup

1) Align the notch on the left hand side arm and disengage by squeezing the cup and gently pulling the arm outwards. (Fig. 17)

2) Rotate the cup to free it from the other arm

Figure 17



8.2 Replacing the Clear Cup

1) Engage the cup with the notch on the left hand arm and rotate the cup to engage with the notch on the right hand side

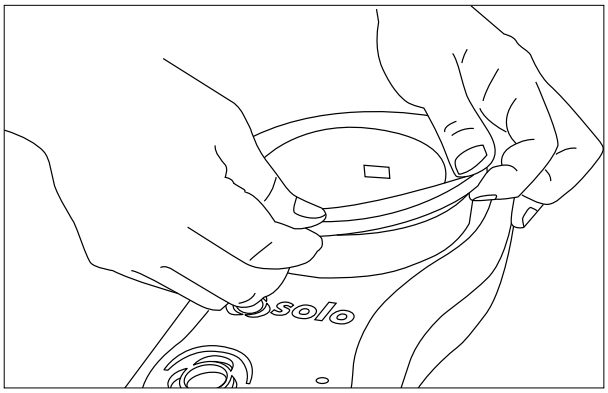
NOTE: Ensure the cup vent is the same side as the back of the unit

8.3 Removing & Replacing the Membrane

1) Ease the membrane off the clear cup gently

2) Take the replacement membrane and stretch it over the clear cup (Fig. 18)

Figure 18



9 Troubleshooting

If when testing, a detector does not activate, repeat the test every10 seconds for up to 2 minutes by keeping the unit at the detector. If the detector still does not activate it may be faulty and need replacement. **Should the status indicator LEDs turn purple**, an internal fault has occurred and the following steps should be taken:

1) Power the unit off and on again.

2) If the problem remains ensure that Solo 365 is powered off before performing any of the following steps:

3) Remove and re-insert the generator, at the same time check the PCB contacts for any debris.

4) Power the unit off, remove the battery. Check the fan moves freely, if not remove the smoke cartridge and generator from within Solo 365. Fan faults may occur due to debris getting inside the unit. Carefully use an air duster and apply to the fan or rotate the fan gently. The use of an air duster such as Solo A7 normally frees the fan of debris. Re-insert the battery and power the unit on.

5) If the problems remain, please contact service@sdifire.com

Unit does not switch on
Check the battery indicator. If solid red, remove the battery from the unit and recharge it.
Smoke not being generated
If the cartridge indicator shows red change the cartridge.Check the generator indicator. If this is solid red then change the generator.
Fan is not rotating
Check for obstructions. Use an air duster to clear debris.

10 Support & Technical

10.1 Maintenance

The Solo 365 unit contains no user serviceable parts. Do not disassemble. In the case of a build-up of dust or dirt on the surface of the product, wipe with a slightly damp lint-free cloth. The area around the smoke duct and within the cup should be cleaned periodically to remove any dirt or fluid. This can also be done using a slightly damp lint-free cloth. Do not use detergents, cleaning materials or solvents to clean the product.

10.2 Technical Information

Operating features	- Color coded LED user information - Proximity sensor starts test - Suitable for detectors up to 4.33" diameter - 5 seconds of stimulus, 5 seconds off repeat cycles
Safety features	- Battery over current cut out - Over temperature cut out - 2 minutes maximum duration time-out - Auto power off after 10 minutes
Power source	Lithium Ion battery pack nominal 3.63V 9.5Wh, with USB charger connection
Battery charging time	~2 hours
Operating temperature range	+5°C to 45°C (+41°F to 113°F)
Operating humidity range	0 to 85% RH non-condensing
Storage temperature range	-10°C to 50°C (+14°F to 122°F)
Storage humidity range	0 to 90% RH non-condensing (up to +35°C/95°F)
Weight (Including battery, generator & cartridge)	1.9lbs
Dimensions H (including handle) x W (widest) x D	16.5" x 7.5" x 4.33"
Dimensions H (excluding handle) x W (widest) x D	11.6" x 7.5" x 4.33"
Dimensions as above with cup in user position	10.25" x 7.5" x 5.9"
Clear cup dimensions	5.9" x 3.33"

10.3 Support Contact

SDi Fire
3535 Route 66, Building 6,
Neptune, NJ 07753
(732) 751-9266
service@sdifire.com

SDi Fire
3535 Route 66, Building 6,
Neptune, NJ 07753

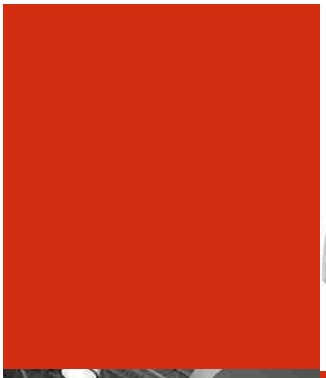
(732) 751-9266
service@sdifire.com

www.sdifire.com

LI39116-5

Quick Start Guide
to the **Solo** range of
detector test equipment

solo™ detectortesters



Kurzanleitung
für **Solo**
Melderprüfgeräte

Démarrage rapide
de la gamme **Solo**
de matériel de test
de détecteurs

Guida rapida per
l'apparecchiatura della
gamma **Solo** per il
colaudo dei rilevatori

Guía rápida para
la gama **Solo** de equipos
de comprobación
de detectores

Solo Testing Kits
Solo Sets
Kits de série Solo
Kit della serie Solo
Kits de la serie Solo

SDi
Specialized Fire Products

Quick Start Guide to the Solo range of detector test equipment

Solo 330 Aerosol Dispenser

Solo 332 Aerosol dispenser available for larger detectors.

1 Unscrew and remove retainer cup.

2 Place aerosol canister into cup.

3 Replace retainer cup and screw upwards. Adjust until aerosol activates and unscrew slightly.

4 Insert the Solo 330 into Solo pole. Place Solo 330 over the detector and press upwards to activate the aerosol (1 second burst).

5 If the detector has not responded in 10 seconds, repeat the test every 10 seconds. Number of total sprays should not exceed 5. If the detector fails to activate, check equipment and retest. If the detector does not activate it will require further investigation.

TIP To prevent the possibility of the aerosol discharging while in transit, loosen the retainer cup by unscrewing 2 full turns.

Maintenance Excess liquid deposits may be experienced following extended periods of use. To clean, use a lint-free cloth. Wash the cup with a mild detergent in warm water and dry thoroughly.

Solo A4 Smoke Detector Tester

Designed to be used only with Solo 330 (332) dispenser.

IMPORTANT
Read the instructions and warnings before use and dispose with care.

Solo C6 CO Detector Tester

Designed to be used only for testing CO Detectors with **Functional Speed-Up Test Feature**.

IMPORTANT
Read the instructions and warnings before use and dispose of with care, even when empty.

Insert straw into the nozzle. Apply the gas using the straw to the entry port of the detector.

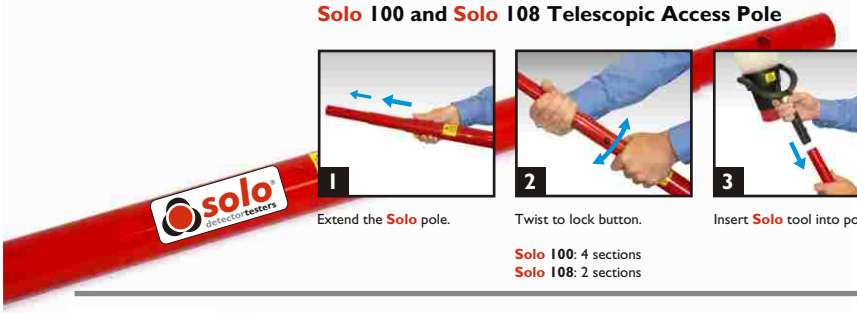
⚠**Caution** Do not use on any other type of CO detector, or with any type of aerosol dispenser.

Solo A7 Detector Duster

Designed for handheld use only. Use a Solo 200 removal tool to remove and clean high-mounted detectors.

IMPORTANT
Read the instructions and warnings before use and dispose with care.

Solo 100 and Solo 108 Telescopic Access Pole



1 Extend the Solo pole.

2 Twist to lock button.

Solo 100: 4 sections
Solo 108: 2 sections

3 Insert Solo tool into pole.

A Solo 101 1.1m extension pole can extend the Solo 100 and 108 telescopic pole, or may be used by itself with the Solo range of tools.

Tip A maximum of 3 extension poles is recommended.

Maintenance The Solo poles can be cleaned with mild detergent in warm water and a soft lint-free cloth. Lubrication is not necessary.

⚠**Warning** The use of Personal Protection Equipment is recommended when using tools at height.

Solo 461 Cordless Heat Detector Tester

1 Insert a charged battery baton into the tool and pole.

⚠**Caution** Ensure correct orientation when inserting battery baton into tool and do not use undue force to insert.

2 Press the red switch to turn on. LED illuminates green. Flash at slow rate indicates normal STANDBY mode.

3 Position the latch and place over detector.

Tip Ensure the detector rests firmly on platform.

4 The tool will automatically start testing when infra-red beam in cup is broken. The green LED will flash faster. Hold in place until the alarm is activated*. When the detector alarms, remove the tool from the detector.

It will revert to standby mode (slow flashing green LED), and the internal blower will cool the heating element for a few seconds. After testing, switch off at red switch to preserve battery baton life.

(*If the detector fails to activate it may be faulty. Insert a replacement detector and test again)

⚠ **Caution**
Remove battery baton when not in use.

Solo 760 Battery Baton Charging

1 Connect charger to power outlet or lighter socket in vehicle using mains lead supplied or the umbilical DC connecting lead. Power LED will illuminate.

2 Connect battery to charger. Fast Charge LED will illuminate.

When battery baton is fully charged, Fast Charge LED will extinguish. Trickle charge LED will illuminate.

⚠**Warning** Do not attempt to use or charge the battery baton if either the charger unit or the battery baton connection point are damaged.

International power outlet cables are available from your supplier.

Tip Ideally, fully discharge battery baton in normal use before recharging.

Solo 423/4 Heat Detector Tester

1 Attach power cable, secure clip, and if required, add optional extension cable.

2 Insert the tool into Solo pole.

3 Connect to power and press ON switch. Place over detector.

4 If detector does not activate within 1 minute it may be faulty.

Solo 423 (110v)
Solo 424 (230v)

Fitted with a thermal cut-out protection system.

⚠ SAFETY INFORMATION

DO NOT TOUCH METAL GRID.

DO NOT BLOCK AIR VENTS.

NO USER SERVICEABLE PARTS.

Solo 200 Universal Removal Tool

1 Pull and twist the Tri-grips to adjust for different detector sizes.

2 When inserting into a Solo pole, locate lower button for access to detectors at angles.

3 When inserting into a Solo pole, locate lower button for use vertically.

4 Grip detector, twist and pull down to remove.

solo™ detectortesters

Kurzanleitung für Solo Melderprüfgeräte

Solo 330 Rauchmelder-Prüfgerät

Solo 332 Aerosol-Prüfgerät für größere Melder.

1 Halterung für Aerosol-Behälter abschrauben und entnehmen.

2 Aerosol-Behälter einsetzen.

3 Halterung wieder einsetzen und so weit zudrehen, bis Aerosol ausgelöst wird. Anschließend leicht zurückdrehen.

Solo 330 auf Stange aufsetzen.

4 Solo 330 über den zu prüfenden Melder halten. Achten Sie darauf, dass der Melder ganz umschlossen ist. Durch leichtes Drücken gegen die Decke Sprühstoß auslösen (ca. 1 Sekunde).

5 Falls der Melder nicht innerhalb von 10 Sekunden reagiert, Sprühstoß nach jeweils 10 Sekunden wiederholen. Die Zahl der Sprühstöße sollte insgesamt fünf nicht überschreiten.
Wenn der Melder nicht auslöst, überprüfen Sie das Gerät und wiederholen Sie den Test. Sollte der Melder weiterhin nicht auslösen, sind weitergehende Untersuchungen erforderlich.

Pflege Nach häufigem Gebrauch gibt es möglicherweise Rückstände durch überschüssige Testflüssigkeit. Benutzen Sie zum Reinigen ein fusselfreies Tuch. Waschen Sie den Becher in warmem Wasser mit einem milden Reinigungsmittel. Anschließend Becher gründlich trocknen.

⚠**Warnung** Um das Entleeren der Prüfgasdose während des Transports zu verhindern, lösen Sie bitte das Unterteil des Bechers um zwei volle Umdrehungen.

Solo A4 Prüfgas

Hinterlässt bei korrekter Verwendung mit Solo 330 (332) Prüfgerät keine Rückstände.

Wichtig
Lesen Sie vor Gebrauch die Anleitungen und Warnhinweise! Entsorgen Sie den leeren Behälter vorschriftsmäßig.

Solo C6 CO Prüfgas

Nur zum Prüfen von CO-Meldern mit operativer Schnelltest-Vorrichtung.

Wichtig
Lesen Sie vor Gebrauch die Anleitungen und Warnhinweise! Entsorgen Sie den leeren Behälter vorschriftsmäßig.

Strohhalm in die Düse einfügen. Gas über den Strohhalm in die Eingangsöffnung des Melders einbringen.

⚠**Achtung** Vorsicht Nicht bei einem anderen Typ CO-Melder oder jeglicher Art von Aerosol-Spender verwenden.

Solo A7 Entstauber-Spray für Melder

Zur direkten Anwendung ohne Werkzeug. Benutzen Sie den Solo 200 Melderpflücker, um hoch montierte Melder zu entnehmen.

Wichtig
Lesen Sie vor Gebrauch die Anleitungen und Warnhinweise! Entsorgen Sie den leeren Behälter vorschriftsmäßig.

Solo 100 und Solo 108 Teleskopstange

1 Stange ausziehen.

2 Drehen Sie die Stange, bis der Druckknopf einrastet.
Solo 100: 4 Elemente
Solo 108: 2 Elemente

3 Solo-Gerät auf die Stange aufsetzen.

Die Solo 101 Verlängerungsstange (1,1 m) kann zur Verlängerung der Solo 100/Solo 108 Teleskopstangen oder auch einzeln in Verbindung mit dem Solo-Prüfgerätesortiment verwendet werden.

Hinweis Es wird empfohlen, maximal drei Verlängerungsstangen zu verwenden.

Pflege Die Solo Stangen können mit einem milden Reinigungsmittel in warmem Wasser und einem weichen, fusselfreien Tuch gereinigt werden.

⚠ **Achtung** Der Gebrauch von Arbeitsschutzkleidung wird empfohlen, wenn mit den Werkzeugen über kopf gearbeitet wird.

Solo 461 Kabelloses Wärmemelder-Prüfgerät

1 Einen aufgeladenen Akku-Stab in Werkzeug und Stange einführen.
⚠ **Achtung** Darauf achten, dass der Akku korrekt herum in das Werkzeug eingelegt wird. Beim Einsetzen keine Gewalt anwenden.

2 Zum Einschalten den roten Schalter drücken. Die LED leuchtet grün. Langsames Blinken zeigt Ruhebetrieb (Standby) an.

3 Die Prüfgerätposition einstellen und Prüfgerät über den Melder halten.

Hinweis Stellen Sie sicher, dass der Melder fest auf der Plattform aufliegt.

4 Der Meldertest startet automatisch, sobald der Infrarotstrahl in der Fassung unterbrochen wird. Die grüne LED blinkt schneller. Prüfgerät auf Position halten, bis der Melder Alarm auslöst. Dann Prüfgerät vom Melder entfernen. Es schaltet in Bereitschaftsstellung (langsam blinkende grüne LED) und das interne Gebläse kühlt das Heizelement für einige Sekunden. Prüfgerät über roten Schalter ausschalten, um Batterien zu schonen.
(*Falls der Melder nicht auslöst, könnte er defekt sein. Tauschen Sie den Melder aus und wiederholen Sie den Test.)

⚠ **Achtung** Akku nach dem Gebrauch entfernen.

Solo 760 Anleitung zum Aufladen der Akku

1 Ladegerät an Steckdose oder Fahrzeug-Zigarettenanzünder mittels beigefügtem Netzkabel oder Gleichstrom-Verbindungskabel anschließen. Die Netz-LED leuchtet auf. Bei vollständig geladenem Akku erlischt die Schnellade-LED. Die LED für Erhaltungsladung leuchtet auf.

⚠**Warnung** Nicht versuchen, den Akku zu benutzen oder aufzuladen, wenn das Ladegerät oder die Akkukontakte beschädigt sind.

2 Akku an Ladegerät anschließen. Die Schnellade-LED leuchtet auf. Bei vollständig geladenerm Akku erlischt die Schnellade-LED.

Verschiedene internationale Steckertypen erhältlich.

Tipp Für eine lange Lebensdauer der Akku entladen Sie die Akku vollständig, bevor Sie das Wiederaufladen starten.

Wärmemelder-Prüfgerät Solo 423/4

1 Stromkabel anschließen, Klemme sichern und, soweit erforderlich, das optionale Verlängerungskabel anschließen.

2 Prüfgerät auf Solo-Stange aufsetzen. Befestigungsclip. 423/4 auf stange aufsetzen.

3 An Netzspannung anschließen, einschalten (grüner Schalter) und über den Melder halten.
.

4 Löst der Melder nicht innerhalb von 1 Minute aus, ist er möglicherweise defekt.

In zwei Versionen erhältlich:
Solo 423 (110 V)
Solo 424 (230 V)

Mit thermischer Sicherheitsabschaltung versehen.

⚠ WARNUNG

METALLGITTER NICHT BERÜHREN.

LÜFTUNGSÖFFNUNGEN NICHT BLOCKIEREN.

WARTUNG ODER REPARATUR NICHT SELBST DURCHFÜHREN.

Solo 200 Melderpflücker

1 Zum Anpassen an verschieden große Meldertypen Dreikanthalter nach oben ziehen und drehen.

2 Beim Aufsetzen auf die Solo-Stange den unteren Einrasteknopf benutzen, um Melderpflücker im Winkel zu positionieren.

3 Für senkrechte Positionierung auf die Solo-Stange den oberen Einrasteknopf benutzen.

4 Melder greifen, drehen und zum Entnehmen nach unten ziehen.

solo™ detectortesters

Démarrage rapide de la gamme **Solo** de matériel de test de détecteurs

Bol test transparent pour détecteurs de fumée Solo 330

Bol test transparent **Solo 332** disponible pour les détecteurs plus grands.

Dévisser et enlever le bol.

Placer l'aérosol dans le bol.

Remettre en place le bol et revisser vers le haut. Ajuster le bol jusqu'à ce que l'aérosol soit activé et devisser légèrement.

Insérer le **Solo 330** dans la perche. Placer le **Solo 330** sur le détecteur, en formant une étanchéité tout autour du bol.

5 Exercer une légère pression vers le haut pour activer l'aérosol. Si le détecteur ne se déclenche pas, renouveler l'étape ci dessus par jets d'une seconde. Ne pas effectuer plus de 5 jets. Si le détecteur ne s'est pas activé, vérifier votre équipement puis renouveller l'opération. Si le détecteur ne s'active toujours pas, une recherche plus approfondie sera nécessaire.

⚠ **Avertissement** Afin d'empêcher que l'aérosol ne se vide pendant les déplacements, desserrer le bol de 2 tours.

Entretien En cas d'utilisation prolongée, un dépôt peutapparaître. Dans ce cas, nettoyer l'intérieur du bol avec un détergent doux et de l'eau tiède à l'aide d' un chiffon doux et non pelucheux.

Aérosol de contrôle de détecteur de fumée Solo A4

Conçu pour une utilisation uniquement avec le bol test transparent **Solo 330** (332).

Important:
Lisez les instructions avant l'emploi et manipulez avec précaution.

Aérosol CO Solo C6

Doit être utilisé uniquement pour tester les Détecteurs de CO avec Fonction de Test Accélérateur Fonctionnel.

Important:
Lisez les instructions avant l'emploi et manipulez avec précaution.

Insérez la tige dans l'injecteur. Appliquez le gaz en utilisant la tige vers le port d'entrée du détecteur.

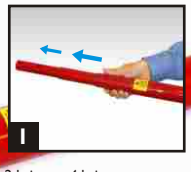
⚠ **Avertissement** Ne pas utiliser sur tout autre type de détecteur de CO ni avec aucun type de générateur d'aérosol.

Dépoussiérant de détecteur Solo A7

Conçu pour une utilisation manuelle uniquement. Veuillez utiliser un outil de démontage **Solo 200** afin de retirer et nettoyer les détecteurs installés en hauteur.

Important:
Veuillez lire les instructions et avertissements avant toute utilisation et mettez au rebut avec soin.

Perche télescopique Solo 100 et Solo 108



2 brins ou 4 brins.

Deployer et tourner pour verrouiller.

Inserer l'outil dans la perche.

Extension Solo 101
Peut être ajoutée à la perche télescopique **Solo 100**, ou utilisée seule avec les outils **Solo**.

Conseil: Un maximum de 3 extensions est recommandé.

⚠ **Avertissement** Les perches Solo peuvent être nettoyées avec undétergent doux et de l'eau tiède à l'aide d' un chiffon doux et non pelucheux.

Il est recommandé de se protéger en cas d'utilisation des outils en hauteur.

Kit bol thermique autonome pour détecteurs thermiques Solo 461

Insérer une batterie dans l'outil et la perche.

⚠ **Attention** Insérez la batterie dans l'outil selon le sens adéquat sans forcer de façon excessive.

Appuyer sur le commutateur rouge pour activer. Le voyant vert s'allume. Un voyant qui clignote à intervalles lents indique un mode en VEILLE normal.

Mettre le système de verrouillage et placer sur le détecteur.
Conseil: Assurez-vous que le détecteur repose bien sur la plate-forme.

4 L'outil démarre le test automatiquement lorsque le faisceau à infrarouge dans le bol est interrompu. Le voyant vert clignote à intervalles plus rapides. Maintenir en place jusqu'à ce que l'alarme soit activée*. Lorsque le détecteur déclenche l'alarme, enlever l'outil du détecteur. L'outil revient en mode veille (le voyant vert clignote à intervalles lents) et le ventilateur interne refroidit l'élément chauffant pendant quelques secondes.

(*Si le détecteur ne s'active pas, cela peut signifier qu'il est défectueux. Remplacer le détecteuret renouveler le test.)

⚠ **Attention** enlevez la batterie en cas de non utilisation.

Instructions de recharge de la batterie du Solo 760 et informations générales

Brancher le chargeur sur une prise de courant ou un allume cigare de voiture, en utilisant lecordon secteur fourni ou un connecteur spécifique. Le voyant d'alimentation s'allume.

⚠ **Avertissement**
Ne pas essayer d'utiliser ou de recharger une batterie si le chargeur ou les points de connexion de la batterie sont endommagés.

Brancher la batterie sur le chargeur. Le voyant de charge rapide s'allume. Une fois que la batterie est totalement rechargée, le voyant de charge rapide s'éteint. Le voyant de charge lente s'allume.

Disponible chez votre fournisseur.

De façon idéale, la recharge doit être effectuée uniquement lorsque la batterie s'est totalement déchargée pendant une utilisation normale.

Bol test transparent filaire pour détecteurs thermiques Solo 423/4

Relier le câble d'alimentation, fixer la pince et, au besoin, ajouter le câble d'extension en option.

Inserer solo 423/4 dans La perche.

Appuyer sur le Commutateur. Placer sur le detecteur.

4 Si le détecteur ne s'active pas, cela peut signifier qu'il est défectueux. Remplacer le détecteur et renouveler le test.

Disponible en version 120 V et 230 V.

Comprend un système de protection thermique.

⚠ AVERTISSEMENT

NE PAS TOUCHER LA GRILLE EN METAL

NE PAS OBSTRUER LES EVENTS.

LES PIECES NE SONT PAS REPARABLES PAR L'UTILISATEUR.

Outil universel de démontage Solo 200

Tirer et tourner.

En cas d'insertion dans une perche Solo, localisez le bouton du bas afin d'accéder à des détecteurs positionnés dans des angles.

En cas d'insertion dans une perche Solo, localisez le bouton du haut pour une utilisation verticale.

Saisir le detecteur. Tourner et tirer.

solo™ detectortesters

Guida rapida per l'apparecchiatura della gamma **Solo** per il colaudo dei rivelatori

Diffusore aerosol Solo 330

Il diffusore aerosol modello **Solo 332** è disponibile per i rivelatori più grandi.

Svitare e togliere il serbatoio nella parte inferiore dell'attrezzo.

Posizionare la bombola aerosol nel serbatoio.

Riporre il serbatoio e avvitare verso l'alto Regolare il serbatoio fino all'attivazione dell'aerosol e quindi svitare leggermente.

Inserire il **Solo 330** nel palo. Posizionare il **Solo 330** sopra al rilevatore, assicurando una buona tenuta intorno alla camera di test.

5 Premere leggermente verso l'alto per attivare l'aerosol. Se il rilevatore non ha risposto, ripetere il punto precedente effettuando leggeri spruzzi di 1 secondo. Il numero complessivo di spruzzi non deve essere superiore a 5. Se il sensore non supera la verifica, controllare l'attrezzatura di test e ripetere la prova . Se il sensore continua a non superare la prova è necessario procedere a verifiche più dettagliate onde stabilire la causa del mancato funzionamento.

Manutenzione Un eccesso di liquido depositato può causare problemi in futuro. Per pulire tale deposito utilizzare un panno pulito oppure lavare la calotta con un detergente non forte in acqua calda e asciugare completamente il tutto.

⚠ **Attenzione** Per evitare che la bomboletta di aerosol si scarichi completamente durante gli spostamenti è consigliabile allentare (con almeno due giriin senso antiorario) la pressione della calotta di contenimento della bomboletta stessa sul dispositivo di test .

Aerosol Solo A4

Destinato a essere utilizzato unicamente insieme al diffusore **Solo 330** (332) dispenser.

Importante
Leggere le istruzioni e le avvertenze prima dell'utilizzo, ed effettuare con cura lo smaltimento.

Tester di rilevatore di CO Solo C6

Progettato per l'utilizzo esclusivo come tester di rilevatori di CO con funzione di test funzionale Speed-Up.

Importante
Leggere le istruzioni e le avvertenze prima dell'utilizzo, ed effettuare con cura lo smaltimento.

Inserire il tubicino nell'ugello. Applicare il gas utilizzando il tubicino nel foro d'ingresso del rivelatore.

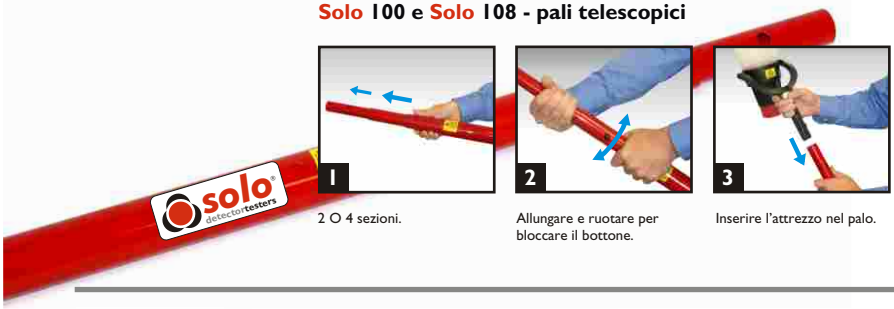
⚠ **Attenzione** Non utilizzare su altri tipi di rilevatori di CO, né con alcun tipo di diffusore aerosol.

Bomboletta per la pulizia del rilevatore Solo A7

Realizzata per essere utilizzata esclusivamente con le mani. Utilizzare uno strumento di rimozione **Solo 200** per rimuovere e pulire i rilevatori montati in alto.

Importante
Leggere le istruzioni e le avvertenze prima dell'utilizzo, ed effettuare con cura lo smaltimento.

Solo 100 e Solo 108 - pali telescopici



2 O 4 sezioni.

Allungare e ruotare per bloccare il bottone.

Inserire l'attrezzo nel palo.

Solo 101 - palo di estensione. Prolungamento da 1.13m del palo **Solo 100**, oppure utilizzato da solo con la gamma di attrezzi Solo.

Suggerimento: Si consiglia un massimo di 3 pali di estensione.

Manutenzione I pali **Solo** possono essere puliti con un detergente neutro in acqua tiepida e con un panno leggero e privo.

Attenzione Durante l'uso dell'attrezzatura Solo su dispositivi in elevate e raccomandato l'utilizzo di dispositivi di protezione individuale.

Tester Solo 461 Cordless per rivelatori di calore

Inserire una batteria a bastone nell'attrezzo e nel palo.

⚠ **Attenzione** Inserendo la batteria nell'attrezzo, verificare che l'orientamento sia corretto. Non forzare.

Per l'accensione premere l'interruttore rosso. Il LED si illumina con una luce verde. Un lampeggio lento indica un funzionamento normale e una condizione di STANDBY.

Fissare l'attrezzo sul palo fino allo scatto del pulsante.

Suggerimento: Accertarsi cheil rilevatore sia posizionato saldamente sulla piattaforma

4 L'attrezzo inizia auto-maticamente a effettuare il test quando si interrompe il raggio infrarosso all'interno del serbatoio. Il LED verde lampeggia più rapidamente. Mantenere in posizione fino all'attivazione dell'allarme*. Quando il rilevatore segnala l'allarme, togliere l'attrezzo dal rilevatore. Il dispositivo ritorna alla modalità standby (il LED verde lampeggia lentamente) e le prese d'aria raffreddano l'elemento riscaldante per alcuni secondi.

(*Si le détecteur ne s'active pas, cela peut signifier qu'il est défectueux. Remplacer le détecteuret renouveler le test.)

⚠ **Attenzione** rimuovere le batterie se non in uso.

Istruzioni per la carica della batteria del Solo 760

Collegare il caricabatterie a una presa di corrente o alla presa per l'accendisigari dell' automobile, utilizzando il cavo di alimentazione in dotazione oppure il cavo diconnessione alla rete 220vca.

Il LED di accensione si illumina.

⚠ **Attenzione**
Non cercare di usare o di caricare la batteria se i punti di collegamento del caricatore o della batteria sono danneggiati.

Collegare la batteria al caricabatterie. Si illumina il LED di carica veloce.

Carica di manteniment.
Carica veloce.

Disponibile presso il vostro fornitore. Quando la batteria è completamente carica, si spegne il LED di carica veloce. Si illumina il LED di carica mantenimento.

Si consiglia di scaricare complemente le batterie prima di ricaricare.

Tester Solo 423/4 per rivelatori di calore

Collegare il cavo di alimentazione, fissare la clip e, se necessario, aggiungere la prolunga opzionale.

Prolunga opzionale. Fissare il morsetto.

Inserire il 423/4 nel palo. Premere l'interruttore. Posizionare sotto il Rilevatore.

4 Se il rilevatore non si attiva entro 1 minuto, può essere guasto.

Disponibile nelle versioni a e 230V.

Dotato di sistema di protezione con interruttore termico.

⚠ AVVERTENZA

NON TOCCARE LA GRIGLIA METALLICA.

NON BLOCCARE LE PRESE D'ARIA.

NON USARE ALTRI ATTREZZI.

Attrezzo universale Solo 200 per la rimozione dei rivelatori

Tirare e ruotare.

Durante l'inserimento in un'asta Solo, individuare il pulsante inferiore, per accedere ai rilevatori negli angoli.

Durante l'inserimento in un'asta Solo, individuare il pulsante superiore, per l'utilizzo in posizione verticale.

Bloccare il rivelatore, ruotare e tirare verso il basso.

solo™ detectortesters

Guía rápida para la gama **Solo** de equipos de comprobación de detectores

Comprobador de detectores de humo Solo 330

Dosificador de aerosol **Solo 332** disponible para detectores más grandes.

Desenrosque y quite el vaso de sujeción inferior.

Coloque el bote de aerosol en el vaso.

Vuelva a colocar el vaso y enrosque hasta que se active el aerosol. Retroceda ligeramente hasta que no salga gas.

Inserte el **Solo 330** en el tubo. Coloque la campana del **Solo 330** sobre el detector, verificando que haya una buena obturación alrededor de la cámara de humo.

5 Presione ligeramente hacia arriba para activar el aerosol y salga el gas durante 1 segundo como máximo. Mantenga en posición el comprobador. Si el detector no ha reaccionado, repita las instrucciones precedentes con pulverizaciones de 1 seg. La cantidad total de pulverizaciones no debería ser superior a 5. Si el detector no se activa, compruebe el equipo y vuelva a probar. Si el detector sigue sin activarse será necesaria una investigación más a fondo.

⚠ **Aviso** Para evitar una posible descarga de aerosol en los desplazamientos, aflojar dos vueltas completas el vaso roscado que retiene el bote.

Mantenimiento Tras largos periodos de uso se pueden producir excesivos depósitos de líquido. Para limpiarlos, utilizar un paño limpio fino. Lavar la campana con un detergente suave en agua templada y secar cuidadosamente.

Aerosol Solo A4 para comprobar detectores de humo

Producto para utilizar únicamente con el difusor **Solo 330** (332).

Importante
Lea las instrucciones y avisos antes de usarlo y deseche el envase adecuadamente.

Aerosol Solo C6 para comprobar detectores de CO

Concebido para ser utilizado exclusivamente para probar detectores de CO con **reducción de la duración de las pruebas funcionales.**

Importante
Lea las instrucciones y avisos antes de usarlo y deseche el envase adecuadamente.

Inserte la varilla en la boquilla. Aplique el gas en el punto de entrada del detector haciendo uso de la varilla.

⚠ **Aviso** No lo use en ningún otro tipo de detectores, ni con ningún otro tipo de dosificador de aerosol.

Aerosol Solo A7 para la limpieza de detectores

Diseñado exclusivamente para ser utilizado de forma manual. Emplee únicamente una herramienta de extracción **Solo 200** para quitar y limpiar detectores instalados en altura.

Importante
Lea las instrucciones y avisos antes de usarlo y deseche el envase adecuadamente.

Pértigas telescópicos Solo 100 y Solo 108

2 secciones (Solo 108), 4 secciones (Solo 100).

Extienda y gire hasta trabar el botón en cada sección.

Inserte el dispositivo en el tubo, trabando el botón.

El tubo de extensión **Solo 101**, de 1,14m de longitud, puede utilizarse para prolongar la pértiga **Solo 100** o de forma independiente como pértiga de los dispositivos de la gama Solo.

Sugerencia: Se recomienda utilizar, como máximo, 3 pértigas.

Mantenimiento Los tubos Solo se puedenlimpiar con agua tibia, detergente suave con un paño que no deje pelusa.

Aviso Se recomienda utilizar un equipo de protección personal adecuado cuando se utilicen dispositivos en altura.

Comprobador autónomo de detectores térmicos Solo 461

Inserte una batería entre el comprobador y el tubo.
⚠ **Aviso** Compruebe la orientación correcta cuando introduzca la batería en la herramienta y no emplee demasiada fuerza para introducirla.

Pulse el interruptor rojo para encenderlo. El LED se iluminará de color verde. Los destellos lentos indican la modalidadnormal de STANDBY (ESPERA).

Ajuste el ángulo del comprobador con la palanquita inferior y colóquelo sobre el detector.
Sugerencia: Verifique que el detector se apoya firmemente sobre la plataforma.

4 El dispositivo comenzará la comprobación auto-máticamente cuando el rayo infrarrojo se interrumpa al introducir el detector en la campana. El LED verde destellará más rápido. Sostenga hasta que se active la alarma*. Cuando el detector entre en alarma, quite el dispositivo del detector. Volverá al modo standby (espera) (el LED verde destellará lentamente) y el ventilador interno enfriará el elemento calefactor durante unos segundos.

(*Si el detector no se activa, puede que esté defectuoso. Introduzca un detector de repuestoy vuelva a comprobar)

⚠ **Aviso** Retire la batería cuando no se encuentra en uso

Instrucciones para el cambio de batería del Solo 760 información general

Conecte el cargador a la red o a una toma para encendedor en un vehículo usando el cable de red provisto o el cable umbilical de conexión con la CC. El LED de alimentación se iluminará.

⚠ **Aviso** No intente usar o cargar la batería si el cargador o los puntos de conexión de la batería presentan daños.

Conecte la batería al cargador. El LED de carga rápida se iluminará.

Cuando la batería esté totalmente cargada, el LED de carga rápida se apagará. Se iluminará el de carga lenta.

Puede obtenerlos de su proveedor.

Lo ideal es descargar la batería por completo durante el uso normal antes derecargarla.

Comprobador de detectores térmicos Solo 423/4

Coloque el cable de alimentación, fije la pieza de ajuste y, si es necesario, añada el alargador opcional.

Cable de extensión opcional. Fije los contactos. Introduzca el 423/4 en el tubo.

Pulse el interruptor de Encendido. Coloque sobre el Detector.

4 Si el detector no se ha activado dentro de 1 minuto, puede que esté defectuoso.

Disponible en versiones para 110 y 230V.

Posee un sistema de protección por interruptor térmico.

⚠ AVISO

NO TOQUE LA PARRILLA METÁLICA.

NO OBSTRUYA LAS VENTILACIONES DE AIRE.

NO CONTIENE PIEZAS REPARABLES POR EL USUARIO.

Extractor universal Solo 200

Regulación de los cabezales triangulares. Estire y gire.

A la hora de introducir en una pértiga Solo, sitúe el botón inferior de forma que pueda tener acceso a detectores instalados en ángulo.

A la hora de introducir en una pértiga Solo, sitúe el botón superior de forma que pueda usarlo verticalmente.

Gire y estire hacia abajo.

solo™ detectortesters

Solo Testing Kits

Solo Sets
Kits de série Solo
Kit della serie Solo
Kits de la serie Solo

Solo™ Model No.	Smoke Testing*	Heat Testing	CO Testing**	Access Height (approx. max.)	Detector Removal	Carrying Case	Sensitivity Testing	Cell Checker	dB Checker	Duct Checker
808	●		●	12ft		●				
809	●		●	20ft		●				
810	●		●	10ft		●				
818		●		12ft		●				
819		●		20ft		●				
820		●		10ft		●				
850	●		●	20ft	●	●				
851	●	●	●	22ft	●	●				
823	●	●	●	30ft	●	●	●	●	●	●
ST1	●	●	●	30ft	●	●	●	●	●	●
ST2	●	●	●	30ft	●	●	●	●	●	●

*Using Smoke Detector Tester Aerosol
**Using CO Detector Tester Aerosol

Individual Solo Components

Solo™ Model No.	Product	Description
A4	Smoke Test Aerosol	Canister (for use with **Solo 330/332 Dispensers**)
C6	CO Test Aerosol	Canister (for testing CO Detectors with **Functional Speed-Up Test Feature**.)
A7	Detector Duster	Canister (for handheld use only - for access, remove detectors at height with **Solo 200**)
100	Telescopic Access Pole	From 4.8ft. to 14.8ft.in 4 sections for access up to approx. 20ft.
101	Extension Pole	3.7ft. length
108	Telescopic Access Pole	From 4.1ft. to 8.2ft.in 2 sections for access up to approx. 13ft.
200	Removal Tool	For detectors of 2.5in. diameter up to 4.3in. diameter
330	Smoke Dispenser	For testing detectors of up to 4in. diameter
332	Smoke Dispenser	For testing detectors of up to 7 1/8 in. diameter
461	Heat Tester (Kit)	Cordless Heat Tester (inc. 2 x **Solo 760** Battery Batons & 1x **Solo 725** Battery Charger) For testing detectors of up to 4 in. diameter
610	Carrying Bag	For carrying Solo Head Units, Battery Batons, Charger & Aerosol Cans

solo™ detectortesters

Also available from SDi

cellchecker™
Pulse Load Battery Testers

dbchecker™
Sound Level Meter

avchecker™
Duct Detector Air Velocity Test Tool

ductchecker™
Duct Detector Test Tool

flamechecker™
Flame Detector Test Tool

Specialized Fire Products

SDI 3535 Route 66, Bldg 6
Neptune, NJ 07753

Tel: 732-751-9266
Fax: 732-751-9241

Email: sales@sdifire.com

solo™ detectortesters

Trutest Troubleshooting

- Check the aerosol canister. Is it inserted correctly and fully? The canister should protrude from the bottom of the receptacle by ½"(Ins.)
- Is the nozzle on the can attached and is the can at room temperature?
- Is the can empty or close to being empty?
- When/If the machine is testing, can you hear the aerosol firing/clicking?
- Is the fuse on the MCU OK?
- Have you tried using both data cables and is the same error coming up with both?
- Have you checked all of your connections?
- Is the reflector in the test cup still level by eye?
- Has the unit been dropped recently? – Are any of the test tubes loose from their collars?
- When was the last calibration performed? (refer to the sticker on the left side of the head unit)

Reset Procedure

A 'System Error Message' may sometimes be resolved by performing a reset.

NOTE: This will only work with version 2.1C and above.

1) Connect the control unit to the main unit with the cable as if you were doing the test
2) Turn on the unit (Make sure it says v2.1C or above)
3) Press [Set-Up]
4) Press [3] for number of tests
5) Press [Test Mode]. The diagnostics mode will come up.
6) Press [9] to reset the sensors
7) Press [1] for yes
8) Shut the control unit off and then back on. The sensor is now reset.
   Try running the machine now. If it still fails it MUST be returned for Calibration Diagnostic Mode.

The Trutest Request Return Materials Authorization (RMA) can be requested at:
http://www.sdifire.com/site/support/support_rma_request_form/

trutest™

DETECTOR SENSITIVITY TESTER

User Manual

OPERATING, SAFETY AND MAINTENANCE INSTRUCTIONS

Issue 2.1e

SIGNALING UL LISTED

Fire Alarm Equipment
77TL
Smoke Aerosol
Generator

CE

Read and understand this manual before using Trutest. Failure to do so will increase the risk of injury.

i. SAFETY INSTRUCTIONS

Before operating Trutest, read this User Manual and become familiar with it and the equipment. Safe and efficient operation can be achieved only if the equipment is properly operated and maintained. Accidents are caused by failure to follow fundamental rules and precautions.

This product has been designed and tested to ensure good service and safe operation and the instructions in this manual will permit the user to get the most from Trutest. It has been safety tested and listed for generic use with fire detectors by Underwriters Laboratories in Northbrook, Illinois, USA.

The following symbols, found in this manual, alert you to potentially dangerous conditions to the operator, bystanders, property, or the equipment:

⚠ **WARNING**	***This symbol refers to a hazard or unsafe practice that can result in severe personal injury or death.***
⚠ **CAUTION**	***This symbol refers to a hazard or unsafe practice that can result in personal injury or product or***

⚠ WARNING

WORKING WITH TOOLS AT HEIGHT CAN BE DANGEROUS. Falling objects can cause serious injury or death.

Trutest is designed to be used at height. It may be mounted ***solely*** on the top of SOLO™ telescopic operating poles.

- The manufacturer recommends that users wear protective headgear when using Trutest above head height.
- To ensure the safety of others, it is recommended that bystanders should be moved out of the area of use when Trutest is being used at height.
- Do not use Trutest unless it is ***securely*** mounted in the correct manner on the specified operating poles. See section 3.6 of this manual for details.
- Always ensure that the spring buttons on the operating poles and the stem at the base of Trutest's main unit are fully engaged, before raising the unit above head height. Failure to do so can result in Trutest falling from the working height.
- Always ensure that the Trutest aerosol canister is firmly located and secured in Trutest, before raising the unit above head height. This will mean that the canister will not be displaced during operation.
- Take great care when raising or lowering Trutest from a height. In particular, be careful not to lose control of the poles. This requires some skill, and prior practice in a safe area is recommended.
- Beware of overhead electrical cables when using, raising or lowering Trutest from a height. High voltages can cause injury or death.
- Ensure that Trutest is always well supported by both the user and the operating poles. This will reduce risk of user fatigue and instability when operating the unit at height.

⚠ CAUTION

AEROSOL CANISTERS CAN BE HAZARDOUS. Pressurized containers can explode if correct method of storage and use is not observed. Contents can be ignited under certain conditions.

When using/handling/storing the Trutest aerosol:

- Always follow the instructions on the canister. Failure to do so will increase the risk of injury.
- Read the Safety Data Sheet supplied with the product.
- CONTENTS UNDER PRESSURE. Protect from direct sunlight and do not expose to temperatures exceeding 120ºF (50ºC). Do not pierce or burn, even after use.
- Use in a well ventilated area. Avoid deliberate inhalation / Do not breathe spray.
- Avoid skin and eye contact.
- KEEP OUT OF THE REACH OF CHILDREN.
- The Trutest aerosol is not defined as flammable by §1500.3 (c)(6), 16CFR, Federal Hazardous Substances Act, C.P.S.C. Regulations, USA. HOWEVER, THE PRODUCT CAN BE IGNITED UNDER CERTAIN CIRCUMSTANCES. DO NOT SPRAY ON A NAKED FLAME OR ANY INCANDESCENT MATERIAL.
- Keep away from sources of ignition – No smoking.
- 20% by mass of the contents are flammable.

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ii. TABLE OF CONTENTS

iii. PREFACE

This manual is:

1) designed to outline the correct methods of operating and maintaining your Trutest system.

2) written in a logical order for first time users.

3) designed to be detailed. It is not, however, possible to cover all situations, possible problems or questions.

4) a controlled document and it is important that the User Registration card be returned.

For further information contact either:

a) the supplier of this manual and system

b) an authorized service center

or

c) No Climb Products Ltd.,
Edison House,
163 Dixon's Hill Road
Welham Green,
Herts.
AL9 7JE
UK

always ***quoting the serial number*** of your Trutest in any communication.

iv. IMPORTANT NOTES FOR THE USER

Safety
Read this manual and the Safety Instructions before using Trutest. The user must be thoroughly acquainted with the procedures in the manual to ensure maximum safety in use.

User Registration Card
Copy the serial number onto your registration card and return in order to register the product with the manufacturer.

Power
The equipment is supplied with a universal battery charger. Remove from outlet when not in use.

Storage
Avoid places subject to direct sunlight or extremely high or low temperatures. Avoid damp or dusty places. Avoid unstable locations and high places from which the unit could fall. Always store components in carry case provided.

Spillage
Care should be taken so that objects do not fall onto, or liquids spilled into, the enclosures through the openings. Do not block the openings. Avoid exposure to rain.

Charging
Do not over-charge the NiCd Battery (charge overnight or 16 hours maximum). Charge when "Low Battery" warning is displayed. Only use the battery charger provided with this equipment. Recharge battery when new, or after prolonged periods of disuse.

Electrical Connections
Do not force any connections. All connections should be made with the power off. Only fit fuses of the recommended size and type (see Specifications, section 8).

Warranty
Service and calibration must be performed by the manufacturer or by an approved service center (see page (viii), Statement of Guarantee and Liability). Trutest has no internal user-serviceable parts. Do not remove any covers or labels. Unauthorized repair or adjustments will invalidate all warranties.

Care
Trutest is a test instrument suitable for use in the field. However, the user should exercise care, as with any item of high caliber electronic test equipment. Damage due to misuse will invalidate all warranties.

v. STATEMENT OF GUARANTEE AND LIABILITY

No Climb Products Ltd. warrants this Trutest system described herein to be free from defect in material and factory workmanship for a period of one year from the date of shipment and agrees to repair such products which, under normal usage and service, disclose the defect to be the fault of No Climb Products. No Climb Products' obligation under this warranty relates to the original purchaser and is limited to a return of the purchase price, or at the sole discretion of No Climb Products Ltd., to the repair or replacement of the system or of any of its constituent parts which may prove to be defective. For this guarantee to be valid, any material or part alleged to be defective is to be returned to No Climb Products Ltd., or an authorized service center, with prior notification and with prior approval, in writing, fully insured and transport prepaid by the purchaser, within 12 months from date of shipment from the factory.

This warranty shall not apply to any unit or to any part of parts of any unit that has or have been:

1. Subjected to misuse, abuse, negligence or accident.
2. Connected, installed, operated, adjusted or serviced other than in accordance with instructions furnished by No Climb Products Ltd.
3. Repaired, modified or otherwise worked on by any person not authorized by No Climb Products Ltd., so that in our opinion the performance or reliability of the instrument has been impaired.

Subject as above No Climb Products Ltd. reserves the right to make replacements with equivalent merchandise and to effect changes at any time in the specification, design or construction of the system without incurring obligation to make any corresponding changes in units previously delivered.

No Climb Products Ltd. accepts no liability for the repair, replacement or substitution or adjustment of any detector which has not been tested in conformity with the instructions for use of the Trutest system as detailed in this manual.

No Climb Products Ltd. assumes no liability for consequential or contingent damages for defective systems covered by this warranty, failure of delivery in whole or in part or for any other cause.

No Climb Products Ltd. assumes no liability for the consequential loss or damage to property or injury to persons resulting from the malfunctioning of fire protection systems or their components which may have been tested with this product. The safe working condition of fire systems and their ability to respond to cases of real fire is neither guaranteed nor implied by tests carried out with this product.

This warranty and the manual to which it is attached constitute the agreement of the buyer and the seller so that no terms conditions or agreements purporting to modify the terms hereof shall be binding unless previously made in writing and signed by an authorized signatory of No Climb Products Ltd.

Patents
This product is covered by U.S. and European patents. Other international patents pending.

European Patent No. (GB & FR)	0698262
German Patent No.	69404648.5
U.S.A. Patent No.	5670946

Note: Because our policy is one of continuous improvement, details of products described within this publication are subject to change without notice. All information provided within this publication is believed to be correct at the time of going to press. Every effort has been made to ensure the accuracy of information, which is provided in good faith, but nothing contained herein is intended to incorporate any representation or warranty either express or implied or to form the basis of any legal relations between the parties hereto, additional to or in lieu of such as may be applicable to a contract of sale and purchase.

1. TECHNICAL DESCRIPTION

1.1. WHY TEST SENSITIVITY?

Over-sensitive detectors are more prone to false alarms. Under-sensitive detectors tend to delay the alarm signal (if they alarm at all). The sensitivity of modern smoke detectors are well controlled during manufacture but detectors in the field are subject to airborne contaminants, aging and outside interference - factors which can all significantly affect sensitivity.

Most detectors currently installed have no facilities for monitoring their own condition. Even analogue addressable sensors can only monitor the 'clean air' response levels, and cannot allow for contamination of the mesh covering entry to the sensing chamber. In the USA, NFPA Fire Code 72, requires frequent sensitivity testing, and local codes are often more stringent.

1.2. WHY TEST IN-SITU?

In-situ testing of smoke detector sensitivity greatly reduces the time and cost of testing a detector for response sensitivity. The detector does not need to be removed for testing, and does not need to be tested once for sensitivity, and again for system response. In-situ sensitivity testing is the only way of ensuring that the undisturbed detector, as installed, is functioning correctly.

1.3. WHY TRUTEST?

A fire system is an expensive and sophisticated apparatus designed to protect life and property. It is imperative that it functions as designed. By delivering a test aerosol of known quality, type and particle size whose concentration is steadily increased, Trutest provides a quantitative assessment of sensitivity, as well as confirming that the detector is capable of receiving an external smoke stimulus and that entry to the sensing chamber is not blocked.

1.4. TRUTEST PRINCIPLES

Trutest is fully automatic. The user merely determines which type of detector is under test and which type of test he wishes to perform. This information is input via a simple menu prompt system into the control unit carried on a shoulder strap. The installed detector is covered with the transparent cup of the main unit and the keypad is pressed to begin the test.

Trutest automatically introduces to the installed detector, a test aerosol of known quality, whose concentration is controlled by the microprocessor in the control unit. The aerosol concentration is constantly increased, while being read by a stable and extremely accurate light obscuration sensor housed in the head of the main unit. A single keypad button press stops the test and the detector's response to the test aerosol is output on the digital display of the control unit. This is then compared with the minimum and maximum values specified for that detector.

For types of test that Trutest will perform, see section 4.3.

2. INTRODUCTION TO TRUTEST

2.1. INTRODUCTION

Trutest is a technologically advanced, fully field-portable device for in-situ testing of smoke detector sensitivity. The equipment is suitable for testing photoelectric and ionization detectors; conventional, addressable and analogue addressable.

⚠ WARNING

- **Before operating Trutest, read the Safety Instructions at the start of this User Manual. Failure to do so will increase the risk of injury.**

The system consists of a main unit mounted on an extendable pole, with a separate control unit and battery pack connected by an umbilical cable. The main unit comprises a cup with a membrane seal which fits around a ceiling mounted detector, and a test aerosol canister with control valve, and high accuracy smoke obscuration sensor.

The tests are conducted by raising the unit to the detector on the ceiling, and then passing a carefully controlled amount of synthetic smoke particles through the detector. The user waits for the detector to activate, and then manually stops the test and the sensitivity result is displayed by Trutest.

The control unit incorporates a microprocessor, keyboard and display, and controls the complete test sequence. A number of standard test types are available, allowing for manual control of the tests, as well as a "pass/fail" type test.

Trutest is designed to be used in the field for commissioning and periodic maintenance of all types of point smoke detectors. All the tests are designed to be employed from the ground by a service engineer, whilst the detectors are still in position, connected and working, providing an accurate simulation of a real fire.

The sensitivity test provides a *quantitative* test, providing a final value in %/ft for each detector, which indicates the actual sensitivity of the detector at that time. The readings are correlated to the UL smoke box, as described in UL268.

2.2. COMPONENTS

The complete set of equipment is comprised of the following main components (not all of which are necessarily supplied):

- Main unit
- Control unit
- Synthetic test aerosols
- Two interconnecting cables (differing lengths)
- Telescopic operating pole
- Height adjustment clamp
- Extension pole (optional)
- Two membrane seals (differing apertures)
- Battery charger
- Carry case
- User manual (this document)

The first three are described in more detail below. See section 3, Assembly Instructions, for more detailed descriptions of all components:

2.2.1. Main Unit

The main unit is mounted on a telescopic operating pole, and consists of a transparent test cup to surround the detector, a high-precision smoke sensor, various control components and internal chambers. The foot of the telescopic operating pole rests on the ground, supporting the main unit when in use.

⚠ WARNING

Trutest is used above head height.

- **Read the Safety Instructions at the start of this User Manual. Failure to do so will increase the risk of injury.**

2.2.2. Control Unit

The service engineer usually carries this unit on a shoulder strap. It consists of a microprocessor, keypad and display, and the battery pack for the Trutest. The keypad and display allow the engineer to start and stop tests, change the operating parameters of the system, specify the type of detector being tested and the type of test to be performed. It also provides feedback of the test sequence and results.

2.2.3. Test Aerosols

Trutest uses a form of synthetic test smoke stored in a pressurized aerosol container. This produces a fine mist of aerosol particles to simulate the smoke from a real fire. The aerosol formula and canister are specific to Trutest, and cannot be substituted with any other test aerosol.

⚠ CAUTION

Trutest uses a pressurized aerosol canister.

- **Read the Safety Instructions at the start of this User Manual. Failure to do so will increase the risk of injury.**
- **Always follow the instructions on the canister.**

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3. ASSEMBLY INSTRUCTIONS

3.1. GENERAL

Trutest is used in the following assembly:

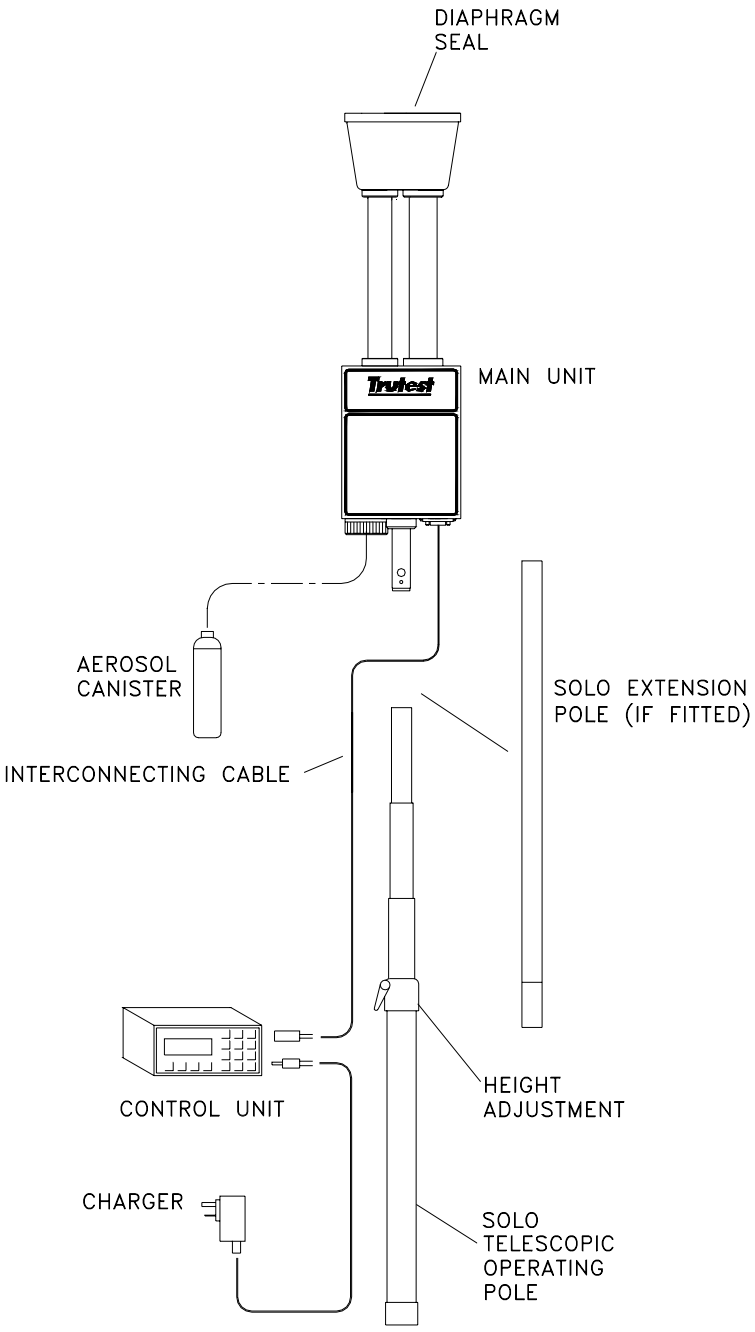

Fig. 1

3.2. COMPONENTS OF TRUTEST

3.2.1 The Control Unit

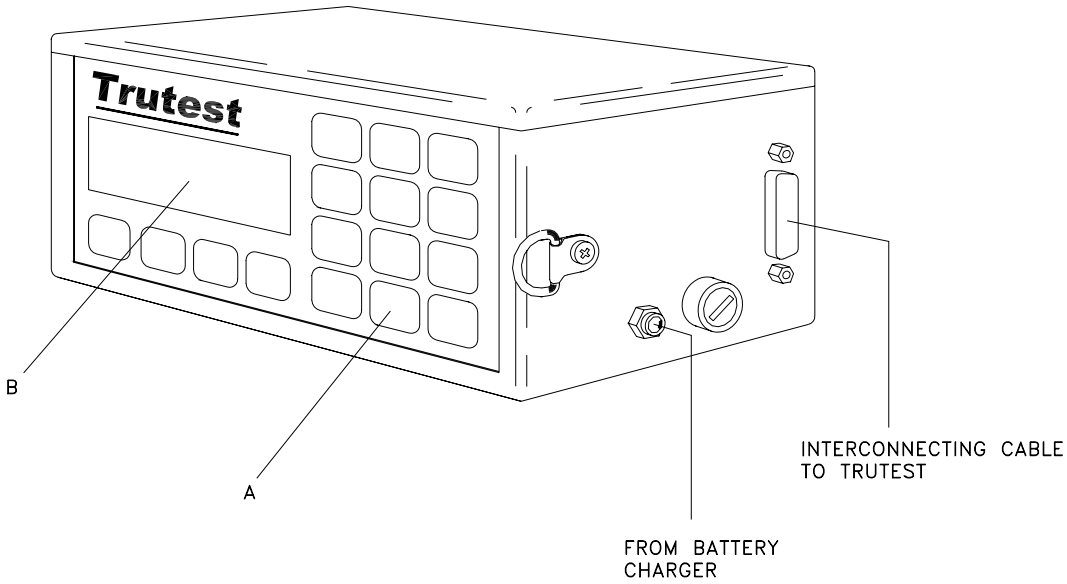

Fig. 2

Carried on a shoulder strap by the operator, the control unit incorporates a microprocessor, LCD display, keyboard and rechargeable battery pack. Commonly used test limits may be pre-stored within the microprocessor for instant recall when required (see Section 4.5., Entering New Test Parameters for Max/Min Mode). At each stage in the test sequence the control unit displays to the user what is happening through visual displays and audible prompts. The control unit is connected to the main unit via the interconnecting cable.

Components of the Control Unit:

3.2.1.1 **The keyboard (A)**: A membrane keypad incorporating tactile contacts that have a soft click action to provide confirmation of operation.

3.2.1.2 **The display (B)**: A 20 character x 4 line LCD display module utilizing supertwist numatic technology to provide a high contrast, wide viewing angle display.

3.2.1.3 **The microprocessor** within the control unit controls the operation of the whole system. It provides a user interface via the keypad and LCD display and controls the aerosol generation, circulation and sensing within the main unit.

3.2.1.4 **The rechargeable battery pack** within the control unit will provide sufficient power for a day of testing. It may then be recharged overnight via the battery charger provided.

Note: *The control unit features an auto power down. If left on, it will automatically switch off after fifteen minutes, thereby saving battery power.*

3.2.1.5 **The sounder** within the control unit produces the following sounds to prompt the user at different stages in the test sequence:

a) When a key is pressed - half second beep.
b) During initialization stage - a single beep every five seconds.
c) During smoke test stage - a slow double beep every five seconds.
d) If an error occurs - a single two-second continuous beep to draw the attention of the user to the display (see section 6.4.).
e) During max/min testing - a rapid double beep at the min value, and a rapid triple beep at the max value (see section 4.3.1.).
f) During clearing stage – a rapid double beep when the 50% clear level is reached and Trutest should be removed from the detector under test (see section 4.8.3.).

3.2.1.6 **Calibration** is factory adjusted and set. Data for the calibration is stored in the control unit during manufacture. Between annual services, there is no need for any interim adjustments, since Trutest is self calibrating.

IMPORTANT: Since the control unit maintains the calibration of the main unit, and should never be interchanged with any other control unit. The serial numbers on the main and control units should always match.

3.2.2. The Main Unit

The main unit is a lightweight assembly that is lifted to cover the detector. It comprises the aerosol dispenser, central aerosol reservoirs, sensor tube, transparent detector cup and return tube. Similar to a smoke tunnel, the test aerosol produced from the canister is taken up the sensor tube where it is measured, before passing through the transparent detector cup covering the detector under test and returning down the return tube for recirculation. The aerosol concentration is continually monitored by the microprocessor via the sensor. The transparent detector cup enables the LED alarm indicator of the detector to be seen illuminating on successful activation of the alarm.

Note: *The main unit contains no user-serviceable parts. The operator needs only to replace aerosol cans from time to time. The unit should not be opened by the user and any action in this respect other than by an authorized service center will invalidate all warranties and guarantees.*

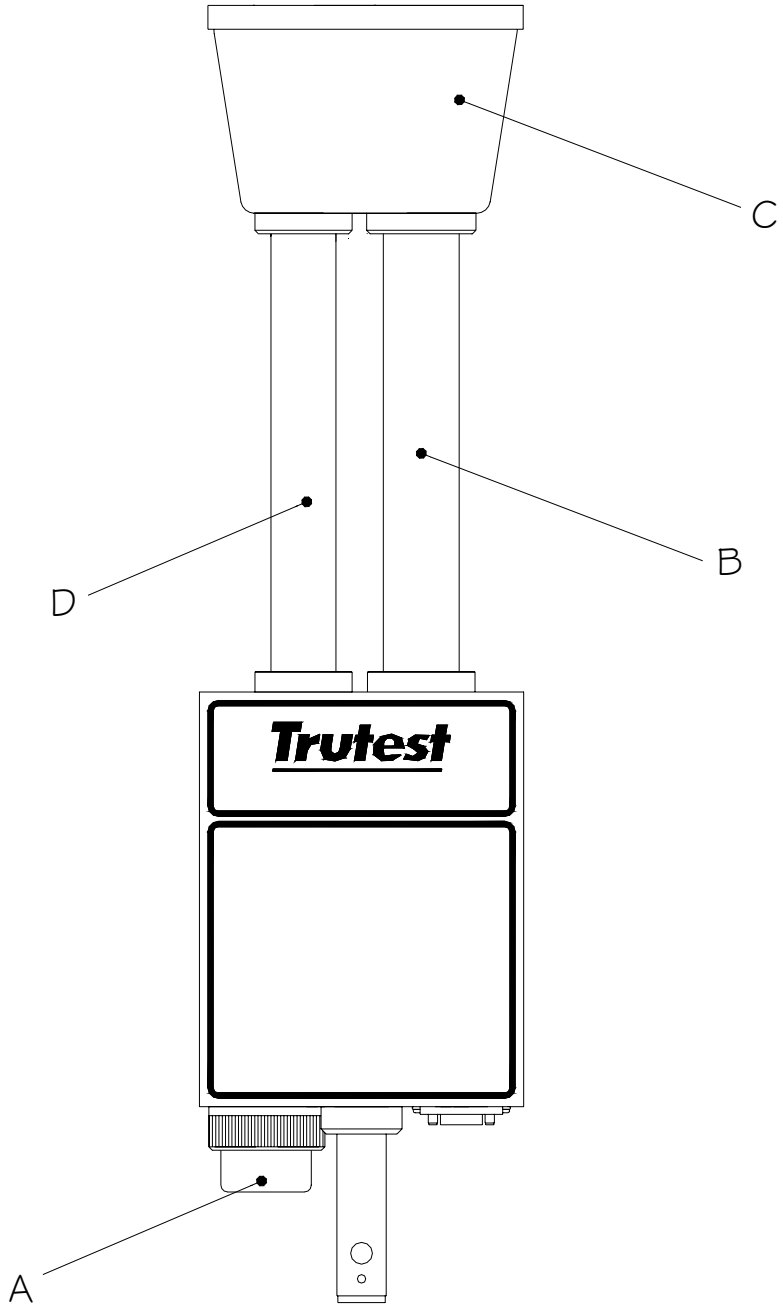

Fig. 3

Components of the Main Unit:

3.2.2.1 **The Aerosol Canister (A).** The aerosol canister contains an "environment friendly", pressurized gas formulation which produces the test aerosol cloud. The aerosol particle sizes simulate the spectrum of particles generated by the smoke of a real fire.

⚠ CAUTION

AEROSOL CANISTERS CAN BE HAZARDOUS. Pressurized containers can explode if correct method of storage and use is not observed. Contents can be ignited under certain conditions.

When using/handling/storing the Trutest aerosol:

- Always follow the instructions on the canister. Failure to do so will increase the risk of injury.
- Read the Safety Data Sheet supplied with the product.
- CONTENTS UNDER PRESSURE. Protect from direct sunlight and do not expose to temperatures exceeding 120ºF (50ºC). Do not pierce or burn, even after use.
- Use in a well ventilated area. Avoid deliberate inhalation / Do not breathe spray.
- Avoid skin and eye contact.
- KEEP OUT OF THE REACH OF CHILDREN.
- The Trutest aerosol is not defined as flammable by §1500.3 (c)(6), 16CFR, Federal Hazardous Substances Act, C.P.S.C. Regulations, USA. HOWEVER, THE PRODUCT CAN BE IGNITED UNDER CERTAIN CIRCUMSTANCES. DO NOT SPRAY ON A NAKED FLAME OR ANY INCANDESCENT MATERIAL.
- Keep away from sources of ignition – No smoking.
- 20% by mass of the contents are flammable.

The number of detectors that can be tested with one aerosol canister will depend on the type of test and state of the detector under test. Typically one aerosol canister may be expected to perform over one hundred tests. Once fitted into its retaining cylinder, the aerosol dispenser is activated by a solenoid within the main unit.

Note: *Only aerosol cans specifically marked for use within Trutest can be used within this device. The use of any other aerosols will invalidate results and may cause irreparable damage to Trutest. Always re-order the same aerosol part number.*

3.2.2.2 **The Solenoid.** Under the control of the microprocessor the solenoid mechanism operates the pressurized aerosol canister **(A)** to release short bursts of aerosol into the aerosol reservoir. This dense aerosol cloud is slowly fed, by a controlled fan, into the sensing loop comprising the sensing chamber, sensor tube **(B)**, detector cup **(C)** and return tube **(D)**.

The aerosol density in the sensing loop has a much lower concentration than in the reservoir, and it is this aerosol cloud which is circulated up the sensor tube, past the smoke detector under test, and back down the return tube. The fans within the sensing loop and the design of the loop tube are arranged so that the airspeed over the smoke detector is maintained at approximately 0.6ft/s or 1.3ft/s for ionization and photoelectric detectors respectively - the optimum airspeed specified to operate smoke detectors.

3.2.2.3 **The Sensor** measures the aerosol concentration in the sensor tube before it enters the detector cup. Trutest uses a very stable and accurate light obscuration sensor. The sensor is fully self-monitoring and self-calibrating in the event of any contamination on the optical surfaces. The output derived from it corresponds to the prescribed method for sensitivity measurement specified for photoelectric smoke detectors in the UL268 standard for point type smoke detectors. An internal correlation to ionization detectors (within Trutest) has been established and verified to enable accurate sensitivity readings to be made of both ionization and photoelectric detectors.

3.2.2.4 **The Detector Cup (C)** is transparent, enabling the user to see the LED of the detector when it activates. The detector is sealed within the cup by a diaphragm seal. A red stripe is provided on one side of the cup that may be aligned with a feature of the detector, such as its LED, to indicate the detector's orientation in the cup. It is recommended that future or repeat tests on the same detector are performed in the same orientation in order to minimize directional dependence i.e. the variation in reading due to detector orientation relative to the direction of airflow in the cup.

3.2.2.5 **Diaphragm Seals:** Two interchangeable silicone diaphragm seals are supplied with the basic kit. Each one is color coded for a particular range of detector sizes (see section 8.1., Trutest

Specifications). Before testing a detector, the user should always check that the correct size seal is being used in order that a good seal is maintained around the detector. The diaphragm helps to seal the detector within the cup, reducing leaks, and together with the slight positive pressure within the sensing loop, preventing the ingress of clean air into the sensing loop after the aerosol concentration has been measured by the sensor.

3.2.3. Telescopic Operating Pole

The SOLO Telescopic Operating Pole supports Trutest while in use, by means of four telescopic sections. The upper two sections will lock at full extension only, but the lower section will lock at any position using the height adjustment clamp. Trutest mounts on the top of the pole directly and the pole is erected to the desired height using the top two sections of pole first, engaging the spring buttons fully. If there is insufficient room to erect any section, then move to the third section and erect it to the desired height before clamping gently with the height adjustment clamp.

The Trutest main unit is located over the detector, and the telescopic poles rest on the floor for the entire duration of the test. The SOLO telescopic pole permits tests on detectors within the range 6ft 5" to 16ft 10" from the floor. For detectors at greater heights, a SOLO extension pole can be used (see below).

If the detector is mounted at an angle (i.e. not horizontally), it may be simpler to exchange it with one that is mounted horizontally in an accessible position. The sensitivity tests can then be carried out on it using Trutest, before returning it to its original position. Be sure to carry out a further ***functional*** test on both detectors which have been moved (as distinct from the ***sensitivity*** test just completed by Trutest) once they have been restored to their final positions. The SOLO range of tools are usually available from your Trutest supplier and permit simple removal and functional testing of detectors.

3.2.4. Extension Poles (optional)

A SOLO extension pole can be added to the SOLO telescopic pole to reach to greater heights. This is added between the SOLO telescopic pole and Trutest. A maximum working height of up to 20ft 8” can be obtained by using a single extension pole.

Detectors mounted at greater heights that require testing should be interchanged with those mounted lower. (Contact the supplier of this system for additional information on removal and replacement tools).

> ⚠ **WARNING**
>
> **Trutest is used above head height.**
>
> - **Read the Safety Instructions at the start of this User Manual. Failure to do so will increase the risk of injury.**
> - **When using Trutest at height, extreme care should be taken. The unit must be carefully controlled when mounted on poles above head height. At great heights this requires some skill.**

3.2.5. Battery Charger

A 12V NiCd battery is incorporated within the control unit. When fully charged it will enable the operator to complete more than one day of continuous testing. The total number of tests obtainable from one charge depends on the type of test that Trutest is asked to perform and the sensitivity level and type of detector under test. Battery Chargers for North America, Japan, Europe, Australia and the UK are available, and a charger for your country should be included in the kit.

To charge the battery, connect the charger to the outlet and to the control unit charger socket (see Fig.2). Charging takes 14-16 hours if the battery is completely exhausted. Do not leave the charger connected indefinitely. Overnight charging is recommended prior to using Trutest. The charger and the Trutest base unit may become slightly warm during charging. This is quite normal.

3.2.6. Interconnecting Cable

Connects the main unit of Trutest to the control unit. Two lengths of cable are supplied, 2.5m and 5m, to suit operation at different heights. The user should use the most convenient length in each application.

3.2.7. Aerosol Canisters

Depending on the type of test and the sensitivity level of the detector under test, a single aerosol canister should perform over one hundred tests. Canisters are usually supplied in quantities of twelve cans.

> **⚠ CAUTION**
>
> **Trutest uses a pressurized aerosol canister.**
>
> - **Read the Safety Instructions at the start of this User Manual. Failure to do so will increase the risk of injury.**
> - **Always follow the instructions on the canister.**

3.2.8. Carry / Store Case

Trutest (excepting SOLO telescopic and extension poles) is packed in a custom case with carrying handle and shoulder strap. Each component has its own compartment. All components should be stored neatly in the case when not in use.

3.2.9. Pole Bag (optional)

A separate pole bag is available for the SOLO telescopic operating pole and extension pole. This is designed to attach neatly and securely to the Trutest carry case such that all equipment is easily transported together.

3.3. SELECTING AND FITTING THE DIAPHRAGM SEALS

Two interchangeable silicone diaphragm seals are supplied with the basic kit. These fit to the top of the transparent detector cup and are used to seal the detector under test within the cup. The seals each cover a different range of detector sizes and are color coded for easy reference.

The pink diaphragm is suitable for testing detectors of diameter from 2.8 to 4.3 inches. The gray diaphragm is suitable for testing detectors of diameters 3.7 to 5.7 inches. Select and fit the required diaphragm for the detectors to be tested.

3.4. FITTING THE AEROSOL CANISTER

The aerosol canister is inserted into the main unit from the base of the main unit as follows:

a) Locate the main unit at a convenient working height, not above the head.
b) Ensure the locking ring "A" is in the released position by turning it anticlockwise (see Fig. 5)
c) Remove empty canister (if present) from main unit.
d) Shake the new canister well before use.
e) Insert new canister such that the nozzle points towards the center of the main unit. If the nozzle is pointing in any other direction, the canister will not fit correctly, and Trutest will not work. Rotate the canister as you insert it so that you can feel the nozzle locate correctly.
f) Pressing can ***firmly*** up into position, tighten the locking ring "A" securely by turning it in a clockwise direction.

Note: *Only aerosol canisters marked for use in Trutest should be used. These are specifically designed for use with Trutest. Any other aerosol is likely to produce incorrect results, and may possibly damage either Trutest or the detector or both. The Trutest aerosols are environmental friendly with a non-flammable propellant gas and are strictly controlled in quality and aerosol characteristics.*

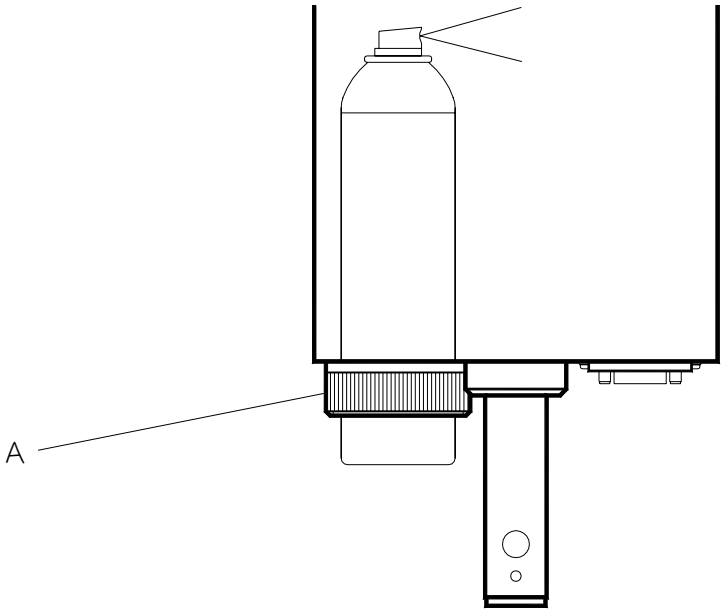

Fig. 5

3.5. PREPARATORY CHECKS

Before assembling Trutest for use, check the following:

a) Ensure that the battery in the unit is fully charged.

b) Ensure that you have the correct poles and extensions required to access the height of the detector.

c) For detectors fitted at heights greater than normal ceiling height, ensure that you have suitable removal tools to enable removal of detectors at height if the detector fails the test and needs replacing. Such tools are usually available from the supplier of Trutest.

d) Ensure that all safety precautions are taken, including additional precautions for working at height. See the Safety Instructions at the start of this manual.

e) Ensure that you have a sufficiently full can of aerosol before starting any testing. Check that you have a full spare can too.

f) Ensure that the serial number on the main unit is the same as on the control unit. Trutest calibrates the main unit and control units together, and they should not be interchanged.

3.6. ASSEMBLING THE EQUIPMENT

a) Determine the type and model of detector to be tested and select the correct diaphragm seal for that detector from the size specifications. Fit this securely to the top of the transparent plastic cup of the main unit.

b) Fit aerosol canister as described above, ensuring that the nozzle of the aerosol has been inserted correctly into the main unit and is pointing toward the center of Trutest.

⚠ WARNING

- **Always ensure that the Trutest aerosol canister is firmly located and secured in Trutest, before raising the unit above head height.**

This will mean that the canister will not be displaced during operation.

c) Attach the interconnecting cable between Trutest main unit and control unit of appropriate length for the height you will be working.

d) Fit Trutest to the top of the SOLO telescopic operating pole, or to the top of an extension pole, should greater height than approx. 17ft. be required.

Rotate the top section of the SOLO telescopic pole or the extension pole when Trutest is positioned on top, to lock the spring button.

e) Next, if an extension pole is used, fit the base of the extension pole to the top of the SOLO telescopic operating pole. Always assemble with the poles in an upright position, adding the extension to the bottom of Trutest, and then adding the telescopic pole beneath the extension pole, rather than by assembling the entire length on the floor and lifting. Lifting the unit from the horizontal may lead to the poles becoming damaged. Check that the extension pole, if fitted, is latched properly to the SOLO telescopic operating pole (by rotating the extension until the button engages) before extending the latter as detailed below.

⚠ WARNING

- **Do not use Trutest unless it is *securely* mounted in the correct manner on the specified operating poles.**
- **Always ensure that the spring buttons on the operating poles and the stem at the base of Trutest's main unit are fully engaged, before raising the unit above head height.**

Failure to observe these instructions can result in Trutest falling from the working height.

f) Place yourself and the Trutest unit directly below the detector to be tested and raise the unit towards the detector. Starting with the top (smallest diameter) pole of the SOLO Telescopic Operating Pole, extend each section to its maximum height and latch the spring buttons by rotating the pole until the button engages.

g) When you reach the stage when the next section will not extend fully, use the lowest telescopic section to finally raise the unit until Trutest's clear cup is positioned over the detector, ensuring that the inlet vents of the detector are well sealed within the cup by the diaphragm seal. Gently tighten the height adjustment clamp to retain this position, with the base of the SOLO Telescopic Operating Pole resting on the ground.

h) The whole assembly should support its own weight, but the user should ensure that it is stable at all times. ***Never leave the poles and Trutest unattended***, even for short periods.

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4. OPERATING INSTRUCTIONS

4.1. PREPARING TO TEST

a) Check that the unit has been correctly assembled as described in the assembly instructions (Chapter 3) before turning on the power. In particular, ensure that the battery has been charged, and the aerosol canister has been correctly installed (see section 3.4., Fitting the Aerosol Canister).

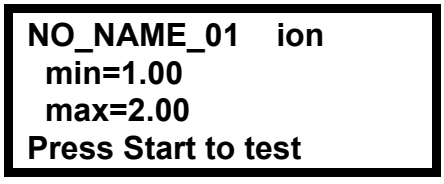
⚠ WARNING

- **Always ensure that the Trutest aerosol canister is firmly located and secured in Trutest, before raising the unit above head height.**

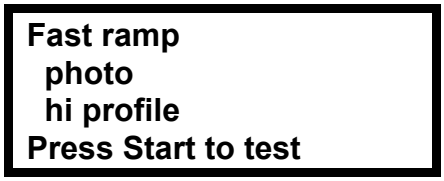
This will mean that the canister will not be displaced during operation.

b) Press the "On/Off" key. The title screen will be displayed as below.

c) This is followed automatically by one of the default screens (those which have “Press Start to test” at the bottom of the screen). For example:



or



or

d) The user must determine which type and model of detector is to be tested, and which type of test is to be performed. The control unit requires up to three pieces of information to be set prior to performing the test.

i) Detector type - photoelectric or ionization and high or low profile.
ii) Test mode - fast ramp, slow ramp or max/min mode.
iii) The setup number (if testing in max/min mode).

This information is entered into the control unit by means of the keypad. The current settings are displayed on the screen.

4.2. SELECTING THE DETECTOR TYPE

Trutest has a different smoke and air flow characteristic to that of the UL smoke box. Conversion factors are used to achieve good correlation between Trutest and the UL smoke box. These conversion factors are different for photoelectric, ionization and the height profile of the detector. Therefore, **the user must select the correct detector type** before beginning each test.

Use the "Det. type" key on the keypad to sequence through the detector types displayed on the screen. The four options are:

- photo lo profile for low profile photoelectric detectors
- photo hi profile for high profile photoelectric detectors
- ion lo profile for low profile ionization detectors
- ion hi profile for high profile ionization detectors

Detectors that protrude more than one third into the cup should be considered as high profile.

4.3. SELECTING THE TEST MODE

Use the "Test mode" key on the keypad to toggle between these three types of test:

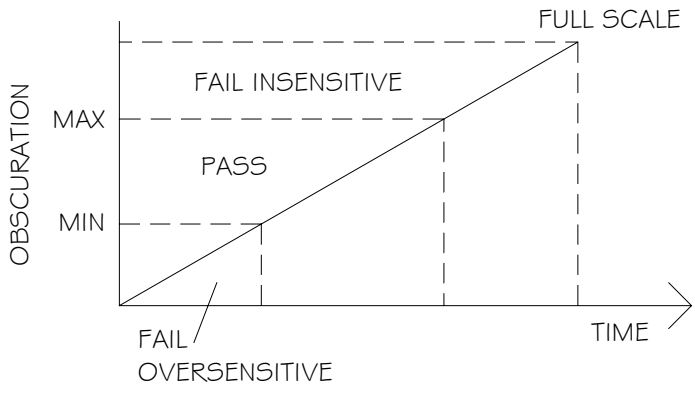
1. Max/min (see section 4.3.1.)
2. Fast ramp (see section 4.3.2.)
3. Slow ramp (see section 4.3.3.)

4.3.1. Max/Min Test

This is used to carry out a quantitative check. Trutest tests whether the sensitivity of the detector falls within an acceptance band or range of sensitivities. It does this by ramping up the concentration of aerosol in the sensing loop, notifying the user when certain pre-determined levels of sensitivity are reached. These parameters are entered by the user against the name of the detector according to its sensitivity rating (see section 4.5., Entering New Test Parameters for Max/Min Mode). To choose which detector setup to use for a max/min test, see Section 4.4., Selecting a Detector Setup for Max/Min Mode.

The user stops the test when the detector alarms, as usual, and Trutest reports either a 'Pass', a 'Fail Over-sensitive' or 'Fail Under-sensitive' result (see section 5.3., Results Screen for Max/Min Test). This result is determined by whether the alarm occurred before, after, or in between the expected minimum and maximum sensitivity values for the detector.

During the test, when the obscuration in the sensing loop reaches the level of the minimum sensitivity parameter entered, a rapid double beep is heard, and a small indicator arrow appears on the display adjacent to the minimum value. Similarly, when the obscuration reaches the level of the maximum sensitivity parameter, a rapid triple beep is heard and the arrow moves to the maximum value. It is simple and quick to tell whether the detector has alarmed within its stated sensitivity band.



Max. is the maximum reading of obscuration in %/ft required to activate the detector. This figure can be determined from the higher sensitivity rating of the detector (printed on the label on the base of most UL listed detectors or from the manufacturers' data sheets) plus any uncertainties in the measurement. For example, Trutest measurement uncertainty (see section 8.1., Trutest Specifications). Detectors which fail to alarm at, or before, this level are deemed to be under-sensitive.

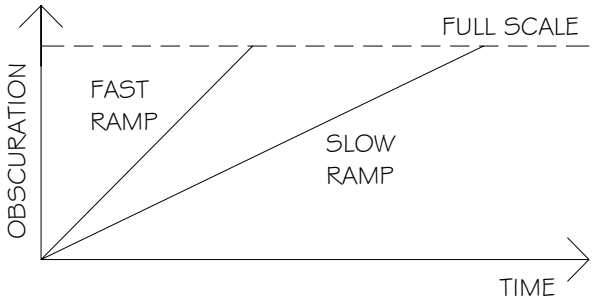
Min. is the minimum reading of obscuration at, or below, which the detector should not activate. This figure can be determined from the lower sensitivity rating of the detector (printed on the label on the base of most UL listed detectors or from the manufacturers' data sheets) minus any uncertainties in the measurement. For example, Trutest measurement uncertainty (see section 8.1., Trutest Specifications). Detectors that activate at, or prior, to this level are deemed to be over-sensitive.

Detector name is a ten character alphanumeric, user selectable label.

4.3.2. Fast Ramp Test

This is used to carry out a fast quantitative check. Trutest increases the concentration of aerosol in the measuring cup and records the point at which the detector alarms. This figure may then be compared with the minimum and maximum acceptable levels specified by the detector manufacturer on the detector or in their data sheets.

The fast ramp test should not be used on detectors with built in delays, as the concentration of aerosol in the sensing loop at the time the detector alarms, may be significantly higher than the level at which the detector was actually triggered, before the delay. This can produce misleading results. In general, the slow ramp mode gives more accurate results, but can take much longer to test a detector than the fast ramp mode.



4.3.3. Slow Ramp Test

This is the most accurate measurement of sensitivity within Trutest, and is used to carry out normal quantitative measurements.

Because of delays built into certain detectors the ramp rate needs to be fairly slow to give an accurate reading. If the ramp rate is too fast, a delay in the detector could mean that the reading of obscuration will have risen considerably since the detector alarm threshold was reached, but before the detector alarmed visibly. This will lead to a higher %/ft reading being recorded.

4.4. SELECTING A DETECTOR SETUP FOR MAX/MIN MODE

The control unit can store up to eighteen sets of max/min test parameters for the min/max testing of the user's most commonly tested detectors. These can be recalled instantly from within the microprocessor's memory when required. Each set of test parameters, numbered 1-18, consists of data concerning the detector, including the maximum and minimum sensitivity acceptance limits stored for that detector.

Before running a max/min test, a make/model of detector needs to be selected from one of the 18 detector setups stored in memory. (If the required detector has not been entered previously it can be entered into the memory by the user, see section 4.5., Entering New Test Parameters for Max/Min Mode.) The user selects the required detector setup as follows:

a) Using the "Test mode" key on the keypad , select max/min testing.

b) If the required detector is not already displayed, press the "Set-up" key on the keypad. (Step (a) may be omitted if the user wishes to enter setup directly from the default screen). The following menu will be displayed:

1.Recall Setup
2.Change Setup
3.Number of Tests

c) Select option 1 by pressing the numeric key "1". A screen similar to the following will appear:

```
01: NO_NAME_01 photo

Which one 01-18?
```

The display shows a detector setup that has been entered previously. The example above shows setup number 1. The cursor will be positioned under the top left-hand character ("0" in example screen shown above).

d) To choose a different detector setup, press the appropriate numeric keys. Even if the number is below 10, two key presses must be entered. For example, for detector setup number 5, enter "0", then "5".

When a number is entered, the display will immediately show any detector setup stored under that number. If an alternative is required, simply type in another number. Press "Enter" to confirm the selection. The display will show the max/min parameters for the detector selected. This allows you to check that these are the correct settings for the detector, prior to beginning the test:

```
05: NO_NAME_05
 min=1.00   max=2.00
 ion        lo prof'
 slow ramp
```

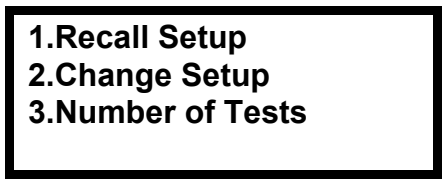
e) Press the "Enter" key again to accept the detector selection.

4.5. ENTERING NEW TEST PARAMETERS FOR MAX/MIN MODE

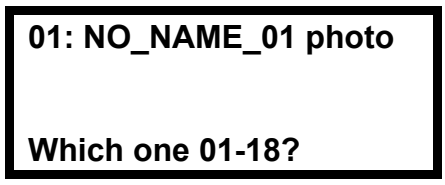
The user can enter up to eighteen sets of max/min test parameters for their most commonly tested detectors.

Each set of test parameters, numbered 1-18, consists of the maximum and minimum sensitivity limits for each detector, the type of detector (ionization or photoelectric), the profile of the detector (high or low profile), and the speed of the ramp (slow or fast) during max/min test. The user programs these parameters in the following manner:

a) From any of the default screens, (see Section 4.1., Preparing to Test) press the 'Set-up' key on the keypad. The following menu screen will appear:



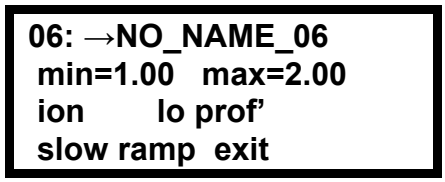
b) Select option 2 by pressing the number "2" on the keypad. The following screen will appear:



c) The display shows a detector setup that has been entered previously. The example above shows setup number 1. The cursor will be positioned under the top left-hand character (“0” in example screen shown above).

d) To choose a different detector setup, press the appropriate numeric keys. Even if the number is below 10, two key presses must be entered. For example, for detector setup number 6, enter “0”, then “6”.

When a number is entered, the display will immediately show any detector name/description already stored under that number. If an alternative is required, simply type in another number. Press “Enter” to confirm that you wish to enter/modify the parameters of this selection. The display will show the max/min parameters for the detector selected, with a cursor, “→”, to prepare for entry or modification:



e) Position the cursor at the field(s) that needs to have new data entered. The cursor is moved about the screen using the keypad ‘arrow’ keys: “2”, “4”, “6”, and “8” representing “down”, “left”, “right”

and “up” respectively. Press “Enter” to modify or enter data in that field.

f) With the cursor positioned adjacent to the detector name field, pressing the “Enter” key reveals the following screen:

```
06:  NO_NAME_06
     ^
ABCDEFGHIJKLM01234 -
NOPQRSTUVWXYZ56789
._
```

A new cursor, “^”, shows beneath the first character of the detector name. New characters can be used in this name/description by changing each one in turn.

g) To change the character with the “^” cursor beneath it, move the flashing block cursor (using the ‘arrow’ keys as above) to the desired character in the list shown in the lower half of the screen. To accept the currently shown choice of character, press “Enter”.

After the final character has been accepted, the user is returned to the setup screen to continue with other parameter entry.

h) For the “min” or “max” fields, simply enter the new values from the keypad. If a value outside the full-scale capability of Trutest is entered, and the “exit” option from the setup screen is chosen, a continuous warning beep of five seconds will sound, and the cursor will be returned to the offending value for alteration. For details of the full-scale values, see section 8.1., Technical Specifications.

i) For the detector type field (ionization or photoelectric), the “Enter” key toggles between “ion” and “photo”. Since the full-scale obscuration values for photoelectric and ionization tests are different, a value for the “max” field which is acceptable for tests on photoelectric detectors, may not be acceptable should the detector type be later changed to ionization. In this case, when the “exit” option from the setup screen is chosen, a continuous warning beep of five seconds will sound, and the cursor will be returned to the offending value for alteration. For details of the full-scale values, see section 8.1., Technical Specifications.

j) For the detector profile field (high or low profile), the “Enter” key toggles between “hi prof’” and “lo prof’”.

k) For the ramp speed field (slow ramp or fast ramp), the “Enter” key toggles between “slow ramp” and “fast ramp”.

l) When all parameters have been entered/modified as required, move the cursor to the “exit” field and press “Enter”. Trutest saves all the changes and returns to the screen, which was displayed prior to entering setup. If Trutest is turned off prior to this, any modifications or changes to the parameters will not be saved.

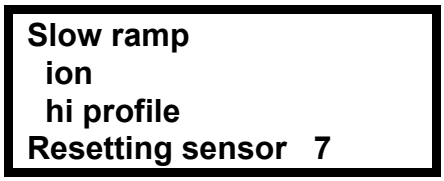
4.6. STARTING THE TEST SEQUENCE

After the operator has assembled the system (see section 3), set the detector type and the test mode (see section 4), the test can begin.

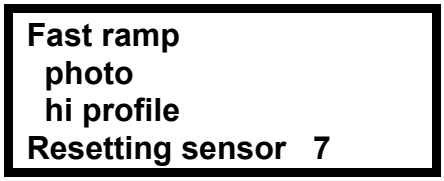
4.6.1 Locate the clear cup of the main unit around the detector to be tested with the diaphragm sealing around the top of the detector. **It is important that a good seal be obtained between the diaphragm and the detector**. The response threshold of the detector may vary slightly depending on its orientation relative to the direction of airflow in the cup. The red stripe on the side of the cup can be aligned with a feature of the detector, such as its LED, to indicate the detector’s position in the cup for future or repeat tests. By always testing the detector in the same orientation, variations of reading due to directional dependence can be minimized.

4.6.2 Use the telescopic poles to rest the unit on the floor. Press the "Start" key on the control unit keypad to initiate the test sequence. Trutest automatically establishes a circulation of clean air within the sensing loop to initialize and zero the internal sensor. This is the initialization stage, during which the display will read "***Resetting Sensor***" and an intermittent beep will be heard from the control unit every five seconds. The display shows a countdown starting at 7, and lasting about thirty seconds.

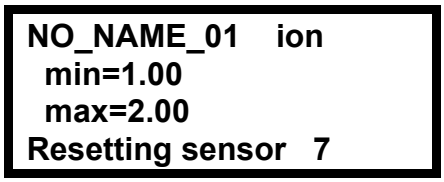
For example, the display reads (for slow ramp, fast ramp and min/max tests respectively):



or

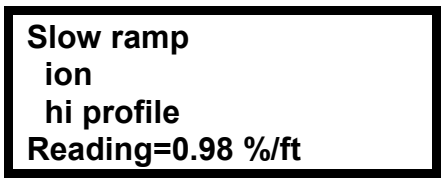


or

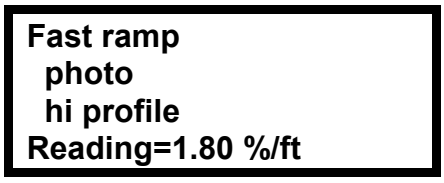


This 'initialization stage' can be carried out without the Trutest cup positioned over the detector e.g. when moving from one test to another, but must be in place for the test to begin (see below).

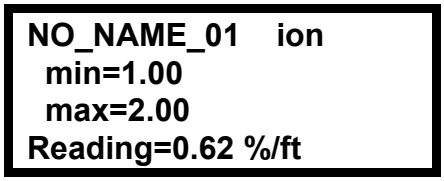
4.6.3 On completion of the initialization stage the smoke sensitivity test will automatically commence. The selected type of test will be conducted (either slow ramp, fast ramp or max/min). Trutest maintains a constant airspeed past the detector while a carefully controlled smoke density is gradually increased. The user will hear the solenoid mechanism pulse the aerosol canister, along with a double beep from the control unit every five seconds. The smoke obscuration reading as measured by the internal sensor is displayed on the screen. Some example screens are shown below, for slow ramp, fast ramp and min/max tests respectively:



or



or



4.6.4 At this point the user is simply a witness as Trutest performs the test. He/she should watch the detector to ensure that the diaphragm is sealed around the top and wait for the LED of the detector to activate when the detector reaches its alarm level. The audible intermittent beep from the control unit assures the user that a test is in operation.

4.7. THE END OF THE TEST

4.7.1 When the detector activates, and the detector Alarm LED lights, press the "Stop" key on the control unit keypad to finish the test. The user will then be presented with the appropriate result screen (see section 5.6., Interpretation of Results).

4.7.2 The test sequence will stop automatically if the detector has not activated (i.e. the "Stop" key has not been pressed) by the time the equipment reaches the full-scale obscuration limit (see section 8.1., Technical Specifications). The result screen should then be checked for the exact reason for the end of the test (see section 5.5., Interpretation of Results).

4.7.3 In all cases, once the test has completed, Trutest unit will rapidly establish a circulation of clean air within the sensing loop to clear the detector and the Trutest Unit (see section 4.8.2).

4.8. COMPLETING THE TEST AND CLEARING THE SMOKE

4.8.1 The result from the screen; either a pass or fail (in the case of a max/min test), or a smoke sensitivity reading (in the case of a ramp test or a max/min test), should now be recorded. The results will remain displayed until the "Enter" key on the keypad is pressed. (A typical results page is printed in Appendix B at the back of this manual).

4.8.2 At the end of the test Trutest rapidly starts to clear the smoke from the detector and its own internal airways and sensor. The amount cleared is

shown on the result screen. When the "Enter" key is pressed, the display returns to the default screen, still showing the amount of smoke cleared from the internal sensing loop. For example (max/min screen):

```
NO_NAME_01    ion
 min=1.00
 max=2.00
Clearing smoke   80%
```

4.8.3 The clearing cycle has two stages:

Stage 1 - Detector clearing (0 - 49%)
It is recommended that the user keeps the detector within the plastic cup during this stage. This will clear any aerosol from the smoke detector so that it will not re-alarm when the fire alarm system is reset. Note however, that there will be very little aerosol to clear since the test will have been stopped as soon as the detector has activated (i.e. at the absolute minimum concentration required to activate an alarm).

Stage 2 - Removal of Trutest (50 - 100%)
When Trutest has reached 50% clear the user will be prompted to "Remove Trutest" and a rapid double beep is heard. It is advisable to withdraw the unit from the detector at this time, as that will help to clear the smoke from the sensing loop more rapidly.

NOTE: Leaving Trutest in position over the detector during this stage will increase the clearing time.

Do not switch off Trutest until all of the smoke clearing stages have completed. The smoke clearing cycle will last between thirty seconds and 3 minutes depending on the concentration of aerosol to clear.

4.8.4 The test is now complete. If another detector is to be tested, the user can go immediately to it and start the next test. However, do not cover the new detector until the smoke clearing stage is complete, and the display shows: "Press Start to test" (see section 7.1. Questions on Usage for a tip on speeding up testing).

If no further testing is required, use the "On/Off" key on the keypad to switch off the control unit and conserve power.

5. RESULTS

5.1. GENERAL OBJECTIVE OF RESULTS

Trutest has been designed to perform on-site sensitivity tests on all makes of smoke detector. The sensitivity of a detector may be defined as the density (concentration) of smoke required to trigger an alarm. Testing with Trutest should enable the user to identify:

a) The ability of the detector to respond to the presence of a pre-defined external smoke stimulus. Much time can be saved since the detector does not need to be removed from its base, tested, replaced and then re-tested for function within the system.

b) The ability of the installed detector to communicate with the panel and raise an alarm.

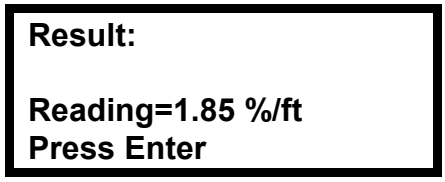
c) Those detectors which may be outside acceptable sensitivity limits. These can then be cleaned or replaced.

d) Any drift in sensitivity of conventional detectors (similar to the function of analogue detectors but with Trutest a true external stimulus is used) and to take corrective action.

5.2. RESULTS SCREEN FOR RAMP TEST

5.2.1 At the point that the "Stop" key is pressed and the test stopped, the final level of obscuration is displayed. This figure may then be compared with the minimum and maximum acceptable levels specified by the detector manufacturer, or may be noted for future comparisons.

5.2.2 The obscuration figure is in %/ft, corresponding to the minimum level of smoke required to activate the detector.



5.2.3 If the obscuration level reaches the maximum level attainable (see section 8., Technical Specifications) and the detector has not alarmed, the test will stop automatically and the message "Full scale" will replace the "Result" field on the screen. For example, the following screen shows a ramp test which reached a maximum attainable obscuration value of 6.00%/ft:

Result:

Full scale=6.00 %/ft
Press Enter

If the Trutest main unit or the aerosol canister is below its standard operating temperature range (i.e. below 50°F (10°C)), the unit may not be able to reach the normal full-scale range. This can also be caused by a faulty aerosol nozzle. However, the display will still report a full-scale reading at the point at which it stopped, even though this may be below the normal maximum. The reading displayed will be the maximum obscuration obtained during the test.

5.3. RESULTS SCREEN FOR MAX/MIN TEST

With the max/min test, Trutest provides a pass or fail result, depending on whether the detector alarmed within or outside the pre-programmed acceptance band. The actual sensitivity reading is shown, and the final result is also displayed as a pass or fail. In some cases, there can be an indeterminate outcome from the max/min test, and this will be displayed also.

5.3.1 If the detector LED is seen to illuminate (the detector activates) before the "min" value is reached, and the key is pressed to stop the test, the results display will read (for an alarm level of 0.6%/ft in this example):

Result:
Failed oversensitive
Reading=0.60 %/ft
Press Enter

5.3.2 If the detector LED is seen to illuminate (the detector activates) between the "min" level and the "max" level, and the key is pushed to stop the test, the results display will read (for an alarm level of 2.3%/ft in this example):

Result:
Detector passed
Reading=2.30 %/ft
Press Enter

5.3.3 If the detector LED does not illuminate (the detector does not activate) by the “max” level, and the key is pushed to stop the test, the results display will read (for an alarm level of 3.1%/ft in this example):

Result:
Failed insensitive
Reading=3.10 %/ft
Press Enter

5.3.4 If the detector LED does not illuminate (the detector does not activate) and the maximum attainable obscuration level is reached (full scale) prior to the “max” level in the max/min test, the test will stop automatically. Since it is not known whether the detector would have alarmed at a higher level, but still below the “max” level, an indeterminate result is displayed. For example, the following screen shows a max/min test which reached a maximum attainable obscuration value of 5.35%/ft, but the “max” value entered for the detector was 5.50%/ft:

Result:
Indeterminate Result
Full scale=5.35 %/ft
Press Enter

See section 5.2.3 for details of the “Full scale” condition when this occurs at a level below the maximum values specified in section 8.

5.4. WARNINGS SHOWN ON RESULT SCREENS

Any of three warning messages may be communicated to the user on the result screens. In place of the first line, and in addition to the results and other parameters on the result screens, there may be one of the following warning messages, which the user must heed (shown in order of priority):

a) Service due soon!
b) Battery voltage low!
c) Sensor drifted!

Each of these messages is described in Section 6.4., Warning Messages.

Should more than one of these messages be relevant at the time of a result screen display, only the highest priority warning will be shown.

A two-second warning beep will accompany any of these warning messages to alert the user.

A typical result screen with a warning message may look like this (example shows a max/min result screen with a pass result):

Service due soon!
Detector passed
Reading=2.30 %/ft
Press Enter

5.5. STORED RESULTS

The unit will store results of the last two tests until the power is turned off.

a) If the user requires reference to a previous test result press the left arrow key ("4"). The following is an example of a result screen which would be displayed (this example shows a ramp test result):

Result:

Reading=1.85 %/ft
Press Enter

b) If the result of the second last test is required, press the left arrow key ("4") again. The following is an example of a result screen which would be displayed (this example shows a passed max/min test result):

Previous Result:
Detector passed
Reading=2.61 %/ft
Press Enter

Pressing the left arrow key ("4") repeatedly will toggle back and forth between the two result screens shown in (a) and (b) above.

5.6. INTERPRETATION OF RESULTS

IMPORTANT - READ CAREFULLY

It should be noted when using Trutest, that there are a large number of factors affecting the sensitivity readings, which should only be judged within the conditions and limits quoted in the Technical Specifications. Detector sensitivity readings can change depending on the orientation of the detector, environmental conditions, wind conditions, differences between Trutest units and aerosol canisters, and the repeatability of the detector.

These systematic and random uncertainties which relate to Trutest are generally covered within the figures quoted in the Technical Specifications. Note also that repeated tests on the same detector, can result in inaccurate readings, if the test aerosol is not given sufficient time to clear totally from the detector. Depending on the detector concerned, this could take as long as five minutes, although in practice, the clearing cycle will stop after about two to three minutes.

All sensitivity results displayed should generally be compared with those values provided by the manufacturer as acceptable for that detector in the field, but also taking into account any uncertainties in the measurement. The manufacturer's values should be printed on the base of the detector, or in the data sheets. Trutest measurement uncertainties are shown in section 8.1., Trutest Specifications. Should any results fall outside of the acceptance parameters, the detector may be considered to be over or under sensitive.

It should be noted that figures from one manufacturer of detectors should not be compared with figures from another manufacturer in an effort to determine superiority of one detector over another. Any conclusions drawn in this manner would be at best subjective and misleading.

Where specific results are not available for a particular model of detector, the user may take a sample number of readings from similar detectors installed on their site, and by statistical means, establish a nominal acceptance band. This is described in more depth in Appendix C. Further, by recording the results of "Ramp Tests" over time on a given detector it is possible to track any drift of that detector.

5.7. ACTION IF A DETECTOR FAILS A TEST WITH TRUTEST

If a detector fails a sensitivity test, there are steps you should take prior to condemning it.

1. Ensure that the aerosol canister in Trutest is not nearly empty. This can easily be determined by shaking the canister and listening for any remaining liquid. If it is nearly empty, replace it with a new canister before proceeding.
2. Ensure that there has been a good seal between the detector and the silicon membrane during the test.
3. Ensure that you have entered the correct details of the detector into Trutest e.g. ionization/ photoelectric and lo/hi profile.
4. The detector should be retested. Be sure to allow adequate smoke clearing time between tests.
5. Also be sure to allow for all measurement uncertainties in your sensitivity acceptance thresholds before condemning detectors. See section 8.1. Trutest Specifications for details of the measurement uncertainties in Trutest. Other uncertainties may exist within the system also e.g. delayed alarm response of detectors, which will be more apparent on fast ramp readings.

Should the detector fail on retest, taking all the above into account, then the detector can be assumed to be out of tolerance.

The detector should now be replaced with another one of the same type and model, and the replacement one should be tested. Note that some detector manufacturers allow for cleaning of their detectors, in which case the faulty detector should be cleaned on site, or returned for cleaning. Please refer to the respective manufacturer for information on cleaning or replacing detectors. If a detector is returned for servicing, it is recommended to mark the final Trutest reading on the detector, including the calculated uncertainty in the measurement.

6. SERVICE AND MAINTENANCE

Trutest is a high quality electronic test instrument and as such, regular calibration and servicing as well as care in use are essential. Regular calibration ensures reliability, and continuing accuracy in use. It is recommended that this product be returned to an authorized service center annually. After 5,000 tests the unit will automatically shut down until it has been serviced.

6.1. USER SERVICING

Little user servicing should be necessary and the user should not attempt to service this equipment beyond that described in this manual. All other servicing should be referred to qualified service personnel at authorized service centers.

6.1.1. Cleaning

From time to time you should wipe the equipment with a soft cloth. For heavier dirt, dampen a soft cloth in a weak solution of mild detergent and water, wring it dry, and wipe off the dirt. Following this, dry immediately with a clean cloth. Do not use rough materials, thinners, alcohol or other chemical solvents or cloths since these could damage the finish or remove the equipment labels. Only qualified service personnel should perform cleaning of the internal parts.

6.1.2. Damage Requiring Servicing

This equipment should be serviced (by qualified service personnel) when:

a) Objects have fallen or liquid has been spilled into the equipment.

b) The equipment has been exposed to rain.

c) The equipment does not appear to operate normally or exhibits a marked change in performance.

d) The equipment has been dropped or the enclosures damaged.

6.1.3. Replacing the Fuse

The fuse holder is located on the side of the control unit and is clearly labeled. Never replace the fuse with any other type / rating than that recommended in the specifications. To replace the fuse, use a flat bladed screwdriver to undo the screw cap, replace the fuse with an identical replacement and refit. If the fuse repeatedly blows, return the ENTIRE Trutest kit for servicing.

6.1.4. User Calibration Check

Trutest has been factory calibrated and tested. There is no reason to believe that there will be any shift in calibration or accuracy, since the sensor is self-monitoring and self-adjusting. If the sensor is damaged the unit will shut down and will not perform tests. However if the user wishes to be sure of the calibration of the unit over an ongoing period, the following is recommended:

a) Take two detectors of factory quality: one ionization and one photoelectric.

b) Test these detectors with Trutest and record the results. Use all modes of test.

c) Keep the detectors in a safe, dry, dust-free environment.

d) After a period of using Trutest, test the detectors again, recording the results. Should the difference be greater than the expected Trutest repeatability PLUS the repeatability of the detector, then it may be necessary to have Trutest re-calibrated.

Note: *No attempt should be made to open Trutest. Entry and subsequent servicing is permitted only by an authorized service center.*

6.1.5. Membrane Condition Check

The condition of the membranes used to seal the Trutest cup to the detector should be checked periodically. Should there be any damage to these membrane seals, results could be affected. Replacements should be obtained from your Trutest supplier in this case.

6.2. ANNUAL SERVICING

In order to maintain the accuracy and performance from this instrument, it is recommended that Trutest be returned to an authorized service center for an annual service and re-calibration. This should be performed annually or after 5,000 tests, whichever is the sooner.

However, Trutest monitors the number of tests performed and announces to the user when calibration is due. Once the test limit of 5,000 tests has been exceeded Trutest will not permit further use without re-calibration and will need to be returned to an authorized service center. A charge will be made for this service.

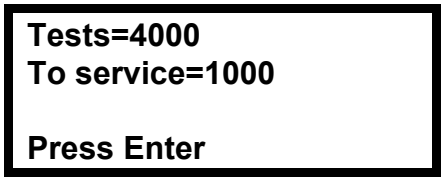
The number of tests performed, and how many remain before obligatory service, can be determined by referring to the Service Screen on the control unit. The product may also have to be returned to a Service Center if other problems occur (see section 6.4., Warning Messages and section 6.5., Troubleshooting Guide). Overseas customers should confirm with the supplier when purchasing where the closest authorized service center is located.

6.3. SERVICE SCREEN

The user can determine the number of tests Trutest has performed since the last service via the Service Screen as follows:

a) From any of the default screens, (see section 4.1., Preparing to Test) press the 'Set-up' key on the keypad. The following menu screen will appear:

b) Select option 3 by pressing the numeric key "3". The number of tests performed and the number of tests remaining before service are displayed on the service screen as follows:



c) Press 'Enter' to return to the original default screen.

6.4. WARNING MESSAGES

The following warning messages are generally preceded by a two-second continuous beep from the control unit.

6.4.1. Low Battery

6.4.1.1 When the NiCd Battery is drained almost completely, the Low Battery Warning message is displayed. If the condition arises during a test, the message will appear on the result screen, but will not interfere with the test. For example:

Battery voltage low!

Reading=1.05 %/ft
Press Enter

At this time, Trutest is able to complete approximately 12 more tests, or one hour of testing. It should then be recharged before further use.

6.4.1.2 When the battery is completely drained, (after approximately 12 more tests or one hour of testing), a further battery warning will appear during the initialization stage:

Warning!
Battery voltage low!

Press Enter

After this warning, the display will return to the start screen, but will not allow any further tests to be performed.

6.4.2. Service Warnings

Trutest automatically monitors the number of tests it has performed in order to provide warning when calibration is imminent. Trutest will permit 5,000 tests before automatic shut down.

6.4.2.1 A warning message will occur when the number of tests remaining before service goes below 250. The message appears on the result screen, for example:

Service due soon!
Detector passed
Reading=1.97 %/ft
Press Enter

The user can determine exactly how far away he/she is from an obligatory service by interrogating the control unit (see section 6.3., Service Screen).

6.4.2.2 When the 5,000 test limit is finally reached Trutest will automatically shut down when the "Start" key is pressed and will not permit any further tests. Instead, the following message will be displayed:

Warning!
Service due NOW!

Press Enter

6.4.3. Empty Aerosol Can

If the aerosol concentration starts to drop rapidly during a test, the aerosol canister probably needs replacing, and the following message will be displayed:

Warning!
Can empty!

Press Enter

At this stage, a new aerosol canister should be fitted, and the test restarted (see section 3.4., Fitting the Aerosol Canister).

6.4.4. Sensor Drift

If the following message appears on a result screen:

Sensor drifted!
Detector passed
Reading=2.64 %/ft
Press Enter

this means that the sensor may be dirty, blocked or misaligned. The results may be unreliable and care should be taken with their interpretation. The unit should be returned to an authorized service center for servicing and re-calibration.

6.4.5. Wiring Fault

If the following screen appears:

Warning!
Head not fitted!

Press Enter

the user should check whether the main unit is correctly connected to the control unit. When everything has been checked, press the “Enter” key and try the test again. This could indicate a fault with the interconnecting lead, so try the other lead if the message persists. After this, if the warning continues, it could indicate a fault with the sensor. In this case, contact a service center.

6.4.6. System Error

If the following screen appears:

System error 0x

the user should press "on/off" on the control unit to reset the system. If it re-appears the user should check the wiring and connections. If it persists, the unit should be returned for service.

6.4.7 Min/Max Error

Should the setup parameters for a min/max test be entered in such a manner that the full-scale obscuration value of Trutest is exceeded for that type of detector, Trutest alerts the user prior to saving setup information. New data entry is prompted, thus ensuring that parameters are within the normal operating range of Trutest.

6.5. TROUBLESHOOTING GUIDE

The following problems do not require professional servicing. If the problem cannot be remedied using this guide, contact your authorized service center for assistance.

Problem	Possible Causes	Remedy
Blank screen, no response from on/off key.	Blown fuse.	Check and replace.
	Flat Battery.	Recharge.
"Head not fitted" warning.	Interconnecting cable not fitted properly.	Check connections at both ends of cable.
No response from main unit	Interconnecting cable not fitted properly.	Check connections at both ends of cable.
Detectors do not alarm.	Faulty detectors.	Check against known detector.
	Wrong settings.	Check settings for correct "Det. type", "Test mode" and "Setup".
Problems obtaining high obscuration Levels.	The system has a leak.	Ensure detector is sealed within cup by diaphragm.
		Check main unit for visible leaks. If found, return the unit to an authorized service center.
		Check condition of diaphragms and replace if damaged or broken.
	Aerosol or room temperature too low.	Check temperature is above 50°F on gauge on main unit. Warm aerosol canister slightly in heated office or car for 30 minutes. (Do not place on radiator or fire).
No rise in obscuration reading on display.	No aerosol canister in main unit.	Check and fit.
	Empty aerosol canister.	Check and replace.
	Dented aerosol canister.	Check and replace.
	Aerosol canister incorrectly loaded.	Check against instructions in manual.
Unstable reading during ramps or poor control.	Wrong main unit parameters stored in the control unit.	Check that the serial numbers on the control unit and main unit match.

7. FREQUENTLY ASKED QUESTIONS

7.1. QUESTIONS ON USAGE

Q: Does Trutest suit all makes of smoke detector?
A: Yes, Trutest has been developed specifically to this end. It is used normally to test against the maximum and minimum values printed on the base of the detector, or in the manufacturers' data sheets. However, where manufacturers' figures are unavailable, a site can still be tested, and individual detectors compared to the average values obtained for that site. A method to produce these field values, is described in section C.1. of the Appendices.

Q: Is Trutest applicable to 'self testing' analogue systems?
A: Analogue addressable and intelligent sensors can only monitor the 'clean air response' or normal quiescent response of the internal sensor. This however does not test the actual alarm level, nor can it take into account variations in atmospheric conditions (dust, air movement, etc.). To determine the response of the sensors to smoke, they still need to be tested periodically with a controlled and measured source of test aerosol. By testing with Trutest can you be sure of the sensitivity to smoke and the continuing accuracy of the sensor.

Q: How long does a test take?
A: The total time required for a sensitivity test varies according to the type of test, the type of detector, and the sensitivity of the detector. Trutest works by gradually increasing the smoke density presented to the detector, therefore the more sensitive the detector, the quicker it will respond. Generally however, a test will take between three and five minutes, including the sensor initialization stage, and the final smoke clearing. In addition, the time taken to get to the next detector, and to position the Trutest unit should be added to give an overall idea of time.

A slower test will generally be a more accurate one since there are often delays in the alarm circuitry of detectors and panels (see section 4.3.3).

TIP: *The smoke clearing stage generally takes between thirty seconds and three minutes, and works faster if the main unit is removed from the detector when indicated on the display. The operator can go on to the next detector, and prepare Trutest for the next test, while waiting for the smoke clearing stage to finish. Even the next initialization can be started whilst 'on the move' between tests, provided that Trutest is located over the detector in time for the test to start.*

7.2. QUESTIONS ON SENSITIVITY & CALIBRATION

Q: How do I know that Trutest will give accurate results?
A: Trutest has been tested at Underwriters Laboratories in the United States, where it has been given a generic listing as an accessory for automatic fire detection systems. The readings on Trutest's LCD are correlated directly to the UL smoke box. Note that readings should always be interpreted correctly in the light of the specification of Trutest and the detector under test. See section 5.6., Interpretation of Results for more details.

Q: Is Trutest's UL listing good for all makes of detector?
A: Trutest has a generic UL listing, which means that it is listed to work with any make of detector.

Q: How will I know that Trutest is correctly calibrated at the start of a test?
A: Trutest is fully self-adjusting and re-calibrates itself at the start of a test. It therefore automatically takes account of any contamination within the system and adjusts to compensate for it. If this is a concern the user can perform his own tests with a detector of known quality at given intervals to prove this. (See section 6.1.4. User Calibration Check).

Q: What is the time interval between services?
A: As Trutest is a high precision test tool, periodic workshop verification and re-calibration will be necessary. To meet international quality standards, a service is required at least once per year, or every 5,000 tests, whichever occurs earlier. The sensor is programmed to "auto shut down" after 5,000 tests or if a problem is detected, and will give a warning before that. See Section 6.2 Annual Servicing.

Q: What happens when the sensor is unable to self-calibrate?
A: Trutest will no longer give results and the LCD will display a message to this effect (indicating a fault with the sensor). At this point the unit will need to be returned for service.

Q: Can the user make adjustments?
A: The only user adjustments are made from the front panel e.g. for detector setup parameters and test selections. There are no user adjustments within the main unit or the control unit.

7.3. QUESTIONS ON EFFECTS OF TEMPERATURE & HUMIDITY

Q: What is the effect of temperature on performance:

A: Extensive tests have been carried out to determine the effect of temperature on the performance of Trutest. As Trutest uses a liquefied gas aerosol canister, the critical operating temperatures are determined by the gas characteristics. The maximum operating temperature is limited to 95°F, as the maximum storage temperature for the aerosol canister is 120°F in line with international safety requirements.

The lower temperatures are, however, far more critical for the performance of the Trutest. If the aerosol canister temperature is too low, the internal pressure drops rapidly and produces too many large particles. This is normally seen when Trutest cannot reach the maximum obscuration level shown in the specifications, but shows a full-scale reading at a lower level. The specified minimum operating temperature of 50°F, is very critical. At this temperature, the performance starts to rapidly drop off, and could affect the detector readings. Always check the room temperature as shown on the indicator strip on the side of the main unit, and ensure that the aerosol canister is at, or above, this temperature when testing.

Note that the action of spraying the aerosol canister causes internal cooling. Therefore the more testing is performed, the lower the temperature drops in the main unit and aerosol canister.

TIP: *Keep a spare Trutest aerosol canister in a warm (i.e. room temperature) place (e.g. in an office). When the temperature in the aerosol canister drops below 50°F (10ºC), exchange it with the warm canister. Also allow a slightly longer time than usual for recovery between tests. This will allow the main unit to recover to the ambient room temperature.*

Q: What effect does relative humidity have?

A: The particles of aerosol smoke used within Trutest**,** as with all smoke particles, are affected by very high levels of relative humidity. At high levels of humidity, where the air is saturated with water, the smoke or aerosol particles act as nuclei for small droplets of water to form. These are not seen as easily by the smoke detectors, and can give a false sensitivity reading. Additionally, as the release of the high-pressure contents from the aerosol canister has a cooling effect, the relative humidity level is reduced further, so that water particles start to form.

TIP: *Relative humidity tends to be highest at sunset and sunrise in some climates (this causes dew). If the sensitivity readings for a number of detectors appear to be suspect in the early morning or late evening, it could be caused by high humidity. Try retesting these detectors in the middle of the day.*

7.4. QUESTIONS ON TRUTEST AEROSOL

Q: How consistent and repeatable are the aerosol characteristics?
A: Very. This is a function of the aerosol canister, chemical formulation, valve and spray nozzle. All are subject to strict quality control (as is the rest of Trutest).

Q: What effect does "aging of smoke" produce?
A: With ionization smoke detectors there are often concerns due to 'aging' of smoke. Tests were carried out in which a high concentration of aerosol was maintained up to 120 seconds. The results showed that this process did not affect the relative sensitivity of ionization detectors.

Q: How many tests can the user get from a canister of aerosol?
A: This will depend on the type of test that Trutest is asked to perform, the design of the detector and the relative state of sensitivity of the detector under test. An average of 100 tests per canister can be expected.

Q: What is in the aerosol canister?
A: The Trutest aerosol uses a mixture of an "environmentally friendly", non-flammable propellant gas liquefied at high pressure with non-toxic active ingredients. It has been tested for compatibility with detectors and users. For more details see the aerosol health and safety data sheet supplied with the product. Note that being a pressurized container, it will need sensible handling and be subject to certain transport regulations. Always follow the instructions on the canister.

Q: Can the Trutest aerosol smoke be ignited?
A: The Trutest aerosol is not classed as flammable by the Federal Hazardous Substances Act, which determines the correct level of classification and labeling for aerosol goods in the USA. However, since almost anything can burn if sufficient energy is deployed, it is possible to ignite the spray under very severe conditions. These conditions have been investigated and have been confirmed by UL not to exist either in Trutest nor in its operating environment. As an analogy of this situation, consider a housebrick, which although it burns under certain conditions, is virtually impossible to ignite with a match.

Q: Can any other smoke aerosol canister be used in the device?
A: No. The tool is designed to use only the special Trutest aerosol canisters, and a different product would not work or give correct results. Other formulations could cause serious damage to both the detector under test and Trutest.

Q: Why do ionization detectors require a greater concentration of aerosol to activate?
A: The particle size distribution of the aerosol, has a relatively higher concentration of larger particles recognized by photoelectric detectors than ionization detectors. This is a deliberate design feature, as the internal obscuration sensor is more sensitive to the larger particles enabling more consistent measurements for both types of smoke detectors.

7.5. QUESTIONS ON BATTERIES AND POWER

Q: How long will one charge of the batteries last?
A: This depends on many factors; different types of test consume different amounts of power. In normal use the batteries last for 8-10 hours of continuous testing. If the tester is switched off whilst moving from detector to detector, this will give at least one full day of testing. The control unit display will prompt visibly and audibly if the batteries are low and it can be recharged overnight. In general, for each hour of charging, the unit will manage one hour of testing.

Q: What would happen if the machine were accidentally left switched on?
A: The machine incorporates an automatic shut down after fifteen minutes without use.

7.6. QUESTIONS ON USER INPUT / USER INTERFACE

Q: How do I set the make and type of detector for each type of test?
A: No specific detector set-up is required for ramp mode, although you do need to select the detector type (ionization, photoelectric, high or low profile). Set-up data for the max/min mode is input via a menu prompt system. The required information is detailed in section 4.4 of this manual "Selecting a Detector Setup for Max/Min Mode"

Q: How does the user know what stage of the test cycle is running?
A: Either by looking at the message on the display or by hearing different beeps from the control unit.

Q: What memory has Trutest?
A: The microprocessor has an internal memory for storing detector settings. Some of this memory is the non-volatile EEPROM type, which will retain information even with the power, is removed. It is used to:

- store default settings;
- store user programmed settings;
- record information relevant to servicing.

7.7. QUESTIONS ON RESULTS AND DISPLAYS

Q: Can the results be recorded?
A: Only by hand. After a test has been completed the results are displayed on the LCD until the "Enter" key is pushed. They can be transferred manually to the results page that is found at the back of the manual. The last two results are stored in volatile memory and can be displayed by toggling the left arrow ("4") key.

7.8. QUESTIONS ON WEIGHT, INSULATION AND PRACTICAL USAGE

Q: What about the weight?
A: Some parts of Trutest are relatively heavy. However, the control unit is suspended on a shoulder strap and the SOLO Telescopic Operating Pole permits the unit to be rested on the floor during testing. This means that the weight of the main unit is never borne for long.

Q: Is the unit electrically insulated (to save the operator from any shock from live cables that may contact the device)?
A: The SOLO Telescopic Operating Pole is made from insulating composite materials to protect the user when accidentally touching high voltage supplies. However the unit should not be viewed as being completely non-conductive. Extreme care should be taken when working near any electrical installations or overhead power lines.

Q: How do we cope with detectors fitted in situations where Trutest can not reach or fit?
A: The detectors which cannot be accessed can either be removed from their bases and placed in more accessible bases (exchanging the detectors) or powered up separately and tested.

Q Can Trutest be used on detectors mounted on sloping ceilings or which have to be accessed from an angle?
A: To a very limited degree. If the aerosol canister is tipped too much, it may not dispense the correct particle sizes. It may be better to exchange with detectors in more accessible positions. You should always ensure that the diaphragm seal properly seals the detector within the cup.

Q: Will Trutest cope with deeper detectors (e.g.: older style or those sitting on junction boxes)?
A: Yes, so long as a seal can be achieved with the diaphragm. Note that only the sensing chamber of the detector has to be sealed within the cup.

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8. TECHNICAL SPECIFICATIONS

8.1. TRUTEST SPECIFICATIONS

Part No.	Component	Dimensions	Weight
SOLO100	Telescopic Operating Pole Length (extended) Length (not extended)	 14ft 9ins (4.50m) 4ft 2ins (1.26m)	3lb 15oz (1.80kg)
SOLO101	Extension Pole	44ins (1.13m)	12oz (0.35kg)
TRUT710	Extension Cable	8ft 2ins (2.50m)	7oz (0.19kg)
TRUT711	Extension Cable	16ft 4ins (5.00m)	11oz (0.32kg)
TRUT730	Height Adjustment Clamp		2oz (0.06kg)
TRUT300	Main Unit (excluding aerosol)	8 x 4 x 29ins (195 x 105 x 740mm)	5lb 13oz (2.65kg)
TRUT351	Control Unit	7 x 3.5 x 4.5ins (175 x 85 x 110mm)	3lb 8oz (1.6 kg)
TRUT753 + TRUT781/ 2/3/4/5	Battery Charger (complete with regional adapter)	3.5 x 2 x 1.3ins (90 x 50 x 35mm)	6oz (0.16 kg)
TRUT702	Gray Diaphragm Seal	Detectors dia. 3.7 - 5.7ins	2oz (0.06kg)
TRUT703	Pink Diaphragm Seal	Detectors dia. 2.8 - 4.3ins	2oz (0.06kg)
TRUT600	Trutest Carry Case	33.5 x 13.5 x 8.5ins (850 x 345 x 210mm)	4lb 11oz (2.12kg)
SOLO602	Carry bag for SOLO poles	50.0 x dia.4.0ins	13oz (0.38kg)
TRUT771	User Manual (this document)		4oz (0.12kg)
TRUT760	Spare Fuse Pack (3 per pack)		0.5oz (0.01kg)
AERO400	Aerosol Canister	2.1ins dia. x 6.8ins (52mm dia. x 177mm)	11oz (0.31 kg)

OPERATING DATA

Trutest uncertainties in sensitivity measurements: *(**Note**: For correct interpretation of results, the tolerance of the detector under test and any other measurement uncertainties must also be taken into account). Specified at 68°F +/- 5°F < 60% RH , using slow ramp.*

All detector types and profiles	± (10% of reading + 0.6 %/ft) typically ± (10% of reading + 0.3 %/ft)

Operating Parameters:

Maximum Working Height:	20ft 8ins (6.3m) (using SOLO100 + SOLO101)
Average Test Time:	120 seconds
Average Calibration Time:	40 seconds
Average Clearing Time:	120 seconds
Average Tests per Aerosol Canister:	100 tests
Average Battery Life:	8-10 hours testing on a full charge
Test Stream flow rate:	0.6ft/s to 1.3ft/s (0.2 to 0.4m/sec)
Resolution:	0.01 %/ft
Aerosol Concentration Range	
Maximum for ionization:	4.00 %/ft
Maximum for photoelectric:	6.00 %/ft
Rate of Rise of Aerosol Concentration	
Slow Ramp:	0.50 %/ft / minute
Fast Ramp:	1.00 %/ft / minute

Type of Aerosol
See Section 8.2 and Safety Data Sheet

Environment:

Operating Temperature:	50°F to 95°F (+10ºC to +35° C)
Storage Temperature:	15°F to 120°F (-10ºC to +50° C) *(Do not store in direct sunlight)*
Humidity:	0 - 85% RH non-condensing

Fuses

Fuse Rating	1A Anti Surge
Fuse Style	20 mm Glass Tube

Battery

Nominal Voltage:	12VDC
Capacity:	2.5Ah
Charger Nominal Voltage:	18VDC

8.2. AEROSOL DATA

Description:

Part Number:	AERO400
General Description:	An environmentally friendly aerosol canister for use with Trutest Smoke Detector Sensitivity Tester.

Specifications:

Dimensions:	2.1ins (53mm) dia x 6.8ins (173mm)
Pressure:	18 bar maximum
Material:	Aluminum monobloc
Contents:	9.5oz (270g) approx. 8.5fl oz (250ml)
Operating Temperature:	50°F to 95°F (+10ºC to +35° C)
Storage Temperature:	15°F to 120°F (-10ºC to +50° C)
Aerosol:	Blended Oxy-hydrocarbons
Propellant:	1,1,1,2 Tetrafluoroethane

Physical Data:

Boiling Point:	-15.7°F (-26.5°C)
Vapor Pressure:	95lb/in^2 (6.70kg/cm^2) at 77°F (25°C)
Liquid Density:	75lb/ft^3 (1.20kg/dm^3) at 77°F (25°C)
Appearance:	Colorless gas, liquid under pressure
Odor:	Very faint ethereal odor

Occupational Exposure Limit:

Gas:	1000ppm (3540mg/m^3) (Long term exposure limit – 8 hr TWA reference period)
General:	Very low acute toxicity; weak anaesthetic at very high concentrations. Not mutagenic in Ames test or CHO cell assay.

See No Climb Products Health and Safety Data Sheet MDS 0065 for more details.

Fire / Hazard Class:	Not defined as flammable by §1500.3 (c)(6), 16CFR, Federal Hazardous Substances Act, C.P.S.C. Regulations, USA. HOWEVER, THE PRODUCT CAN BE IGNITED UNDER CERTAIN CIRCUMSTANCES. 20% by mass of the contents are flammable.
DoT Registration:	DOT2Q, registration no. M5215

UL Listing: 77TL Smoke-Automatic Fire Detector Accessory. Generic listing.

Environmental Information: Tetrafluoroethane is not currently regulated under the Montreal Protocol and may be used as a replacement for regulated CFC's.

⚠ CAUTION

AEROSOL CANISTERS CAN BE HAZARDOUS. Pressurized containers can explode if correct method of storage and use is not observed. Contents can be ignited under certain conditions.

When using/handling/storing the Trutest aerosol:

- Always follow the instructions on the canister. Failure to do so will increase the risk of injury.
- Read the Safety Data Sheet supplied with the product.
- CONTENTS UNDER PRESSURE. Protect from direct sunlight and do not expose to temperatures exceeding 120ºF (50ºC). Do not pierce or burn, even after use.
- Use in a well ventilated area. Avoid deliberate inhalation / Do not breathe spray.
- Avoid skin and eye contact.
- KEEP OUT OF THE REACH OF CHILDREN.
- The Trutest aerosol is not defined as flammable by §1500.3 (c)(6), 16CFR, Federal Hazardous Substances Act, C.P.S.C. Regulations, USA. HOWEVER, THE PRODUCT CAN BE IGNITED UNDER CERTAIN CIRCUMSTANCES. DO NOT SPRAY ON A NAKED FLAME OR ANY INCANDESCENT MATERIAL.
- Keep away from sources of ignition – No smoking.
- 20% by mass of the contents are flammable.

Note: *In summer or on hot days extra care should be taken to protect from sunlight and other high temperatures. Even the boot of a car can reach excessive temperatures. If in doubt, an insulator / "Thermos" type bag should be used to store cans.*

APPENDIX A - AUTHORIZED SERVICE CENTERS

A.1 UNITED KINGDOM

No Climb Products Limited
Edison House
163 Dixon's Hill Road
Welham Green
Hertfordshire
AL9 7JE
UK

Telephone: +44 (0)1707 282760
Facsimile: +44 (0)1707 282777
Email: sales@detectortesters.com
Website: www.detectortesters.com

A.2 UNITED STATES OF AMERICA

SDi
3535 Route 66, Building 6
Neptune, NJ 07753 USA

Telephone: (732) 751 9266
Facsimile: (732) 751 9241
Email: sales@sdifire.com
Website: www.sdifire.com

APPENDIX B - RESULTS PAGE

Serial Number of Trutest Used_____ Date of Tests_____ Sheet _____ of _____

Name of Test Engineer_____ Name of Client _____ Location (Site, Town, City, Country) _____

Detector Tested *Model, Type*	**Location** *Within site*	**Type of Test** *Fast / Slow Ramp or Max/Min*	**Result**	**Comments / observations** *State of detector / Site conditions*

Notes:

APPENDIX C. - DETECTOR PERFORMANCE TABLES

C.1. Method for Producing Detector Performance Tables

If you cannot find the details for the particular type and model of detector you wish to test, the following procedure should be followed:

1. Test a representative sample of the same model and type (e.g. 6) on slow ramp.

2. Test all the detectors on the site (or on more than one site if you have 20 or less of each type), and record the results.

3. At this stage, you should already be able to spot the detectors which are obviously out of norm, as they will be considerably different from the average (up to two times higher, or 2/3 less than the average values).

4. Add up all the values for each model of detector, and divide by the number of detectors to give an average or *Mean* value for that model.

5. To generate *Minimum* and *Maximum* values, a ratio between *Min* and *Max* should be agreed. A typical figure for this could be 1**:**2.2. To create a ratio of 1**:**2.2 of *Min* to *Max*, use the following formula:

   Min = *Mean* x 0.625
   Max = *Mean* x 1.375

6. The *Minimum* and *Maximum* values can be used to check the results already recorded, and can be programmed into Trutest as explained in section 4.5 of the manual. The values chosen should be recorded on a blank Detector Performance Sheet (see Appendix C.2.).

C.2 Detector Performance Sheet

Site:_____ **Date:** _____

[1] **Model** *Manufacturer Ref. No.*	**System Type** *Conventional / Addressable*	**Detector Type** *Photoelectric / Ionization*	[2] **Max.**	[3] **Min.**	[4] **Diaphragm** *Pink or Gray*

[1] Model — The manufacturer's reference or model number for this detector.
[2] Max. — The maximum sensitivity level for this detector model. The detector should have activated by this stage when tested with Trutest.
[3] Min — The minimum sensitivity level for this detector model. At this obscuration value, the detector should not activate when tested with Trutest.
[4] Diaphragm — The size of diaphragm seal to be used to seal this particular detector.

PORTALEVEL® MAX
USER MANUAL

Contents

Note: For information on converting Liquid Levels to approximate agent weights, see the separate guide 'Liquid Level to Weight Conversion,' also on sdifire.com/support.

1. Introduction and key features

What does the Portalevel® do?

The Portalevel® Max is designed to be a portable way to non-invasively locate the liquid level inside any single skinned cylinder. Portalevel®s are capable of detecting the presence of any liquid externally; from water and liquid pressurised gases to firefighting clean agents. Portalevel®s can be used on a huge variety of container types, composed of different materials and of different shapes and sizes, but are typically most used on steel compressed gas cylinders.

Many applications exist for our technology, but it is most widely used as a replacement to both weighing fire suppression cylinders during installation and servicing, or the fitting of internal and invasive liquid level 'float' devices. Once the liquid height inside a container has been found, the contained weight of liquid can be determined, after taking into consideration other environmental factors such as the size of the cylinder and type of liquid.

Portalevel® Max

With an intelligent calibration feature and four separate power settings, the Portalevel® Max is versatile and our most user friendly unit. It is capable of testing a wide variety of fire suppressant agents; CO2, FM200™, NOVEC 1230™, old Halon agents, FE-13™, FE-25™, NAF S III™ and all core Clean Agent Systems.

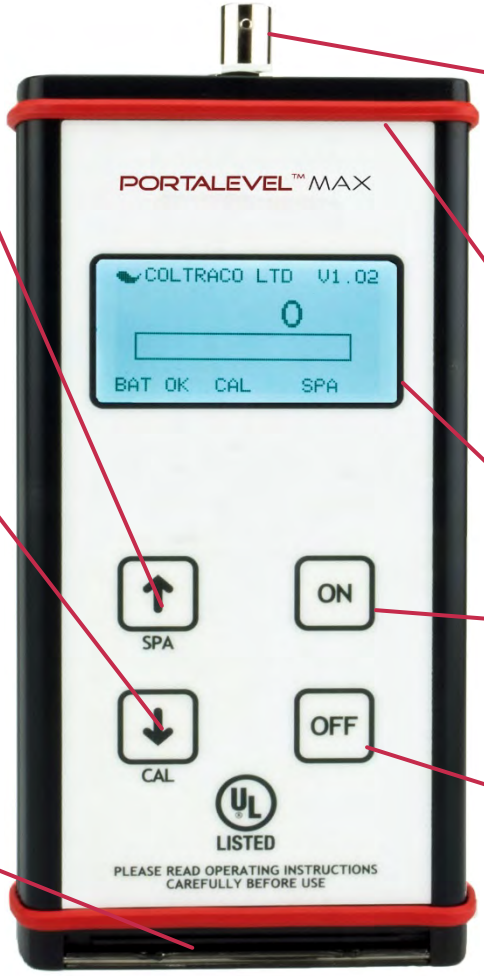
Portalevel® Max

The Portalevel® Max also includes; sensor, and ultrasonic gel (couplant).

SPA: The SPA capability enables an increased strength of signal output to achieve better readings for poor condition cylinders, more challenging applications and large volume uses.

CAL: The CAL button is the standard procedure feature enabling self-calibration prior to testing on each individual cylinder, to ensure accurate and reliable readings.

Battery Compartment: The battery compartment is on the bottom of the unit and has a double gateway to be waterproof. It must be opened by a flat head tool, e.g. a screwdriver in order to change the battery.



Gromit: The gromit at the top of the unit is the ultra secure simple fastening for the sensor

Sealing: Red sealing ring for watertight integrity

Display: 'Go/No-Go' readings for quick and easy use

On: Simple power ON button – powered by 1 x 9V battery providing approximately 8 hours battery life

Off: Simple power OFF button – keep turned off to save battery life

V1.02: Version 1.02

Digital display: Numerical readings for experienced users to gauge a better interpretation of the ultrasound behaviour

Bar graph display: Easy to interpret visual reading

CAL: Highlights when CAL in use

SPA: Checks SPA feature is working

BAT OK: Checks battery level

2. Operating Instructions

POINTS TO CONSIDER BEFORE PROCEEDING:

Do not proceed before reading section 1.

Do not proceed before familiarising yourself with the Training section on page 27.

Introduction
There are three basic procedures which must be carried out when using the Portalevel® Max:

1. Preparation: Function Tests and cylinder preparations. These tests ensure that the Portalevel® equipment is functioning properly and that the cylinder(s) are prepared in a way to give the most accurate readings.

2. Calibration Procedure Identification (CPI): This test allows you to determine which method of testing should be used on the cylinders you wish to measure. Once you know the appropriate method of testing for that type of cylinder, you do not need to perform this again for that testing session.

3. Testing: After step two, you can follow the appropriate testing procedure (1 or 2) for that set of cylinders.

Note: If you move on to testing a different type of cylinder, which is a different size, weight or filled with a different agent, you must repeat step 2 on the new cylinder type to confirm which testing procedure is required.

As with all electronics, do to leave the Portalevel® Max in the sun for long periods of time. Excessive UV exposure can lead to damage of the LCD screen.

1. Preparation

Preparation for testing is simple, quick and ensures you get the most reliable and accurate results from your testing. The FUNCTION Test and DIP Test both ensure the main unit and sensor are working correctly. CYLINDER PREPARATIONS ensure that you test on the best possible area of the cylinder wall.

FUNCTION Test:

A FUNCTION Test should be performed every time you wish to use the unit. To perform the test, simply connect the sensor to the main unit and turn on the Portalevel®. After a couple of seconds, the readout should reset itself to zero. Then press the CAL button. The CAL symbol should become blacked out like this:

Then disengage CAL by pressing the CAL button again and turn the unit off. This completes the Function Test.

DIP Test:

The DIP Test checks whether the sensor you are using is working correctly and is communicating with the Portalevel® main unit.

Step 1: Connect sensor to unit and turn on.

Step 2: Lightly dip the tip of sensor into cup of water vertically. The amount of water in the cup is not important, as long as there is enough to dip the end of the sensor so the black central patch on the end of the senor is submerged, without it touching the bottom of the cup.

Step 3: When dipping the sensor, you should see the readings of the Portalevel® spike to high values and the bar graph rise also. If you do observe this, then the DIP Test is complete and you know the sensor is working well.

CYLINDER PREPARATIONS:

It is important to prepare the cylinders well to attain accurate and reliable readings. To perform CYLINDER PREPARATIONS:

Step 1: Find on the cylinder the side which has the least damage, rust or chipped paint. For accurate testing you must find a vertical strip down the side of the cylinder which is as smooth as possible. You will be placing the sensor and testing along this strip.

Step 2: Wipe down the chosen side of cylinder with damp cloth to remove dirt and debris. This completes the CYLINDER PREPARATIONS.

IF YOUR UNIT FAILS THE FUNCTION OR DIP TEST, PLEASE CONTACT SUPPORT AT (732)-751-9266 OR SERVICE@SDIFIRE.COM

Temperature:

The surface temperature of the cylinders stored must be measured before the liquid levels are checked. This should be measured around half way up the cylinder.

IF THE TEMPERATURE EXCEEDS 86°F (30°C) DO NOT TEST CO_2 or FE-13 CYLINDERS.

Further information regarding this issue can be found on page 20 under Frequently Asked Questions.

2. Calibration Procedure Identification (CPI)

The purpose of this test is to identify whether method 1 or 2 should be used for the cylinder being tested. The details and differences between methods 1 and 2 are explained in the next section.

To perform CPI:

Step 1: Place a strip of gel or water down the vertical strip on the cylinder you chose during CYLINDER PREPARATIONS.

Step 2: Place sensor at top of cylinder (below top wield seam or curve). Take note of digital reading.

Step 3: Place sensor 5cm below. (Take note of digital reading).

Step 4: Repeat Step 3 down the full vertical length of the cylinder.

Step 5: Analyse the results using the guide below.

Compare your results to the guide below to decide whether Procedure 1 or Procedure 2 should be used when testing the cylinders you wish to measure.

INSTANCE 1: "Higher readings were found in the upper portion (gas area) of the cylinder compared with the lower portion (liquid area)." – Carry out Procedure 1.

INSTANCE 2: "Higher readings were found in the lower portion (liquid area) of the cylinder compared with the upper portion (gas area)." – Carry out Procedure 2.

INSTANCE 3: "There was no difference in readings between the upper portion and lower portion of the cylinder" – Carry out Procedure 2.

Both Procedure 1 and 2 are fully explained in the next section.

3. Testing

PROCEDURE 1: TO BE USED WHERE HIGHER READINGS ARE FOUND IN THE GAS PHASE COMPARED TO THE LIQUID PHASE.

Step 1: Place a strip of gel or water down the vertical strip on the cylinder you chose during CYLINDER PREPARATIONS.

Step 2: Place the sensor on the area covered with gel or water and on the UPPER portion of the cylinder, where you are certain the sensor will be above the liquid level. DO NOT place the sensor close to the upper weld or start of the dome, as anomalous readings will be found.

Note: The sensor must always be positioned with the 'TOP' marking positioned pointing exactly upwards. On some sensors the 'TOP' is marked by a simple dot. If the sensor is not accurately placed the right way up, then anomalous readings will be found.

Step 3: Once location has been found, press CAL. A full bar graph will appear on the Portalevel® screen, example below:

Above liquid level

Calibration must be carried out for each individual cylinder tested.

Step 4: Move sensor 5cm down, observing the bar graph.

Note: When moving the sensor, it is important NOT to slide it, as this will damage the sensor pad, rendering the sensor inefficient and inaccurate. Remove the sensor fully and replace in steps each time you move the sensor.

Step 5: Repeat Step 4 until the bar graph reduces and disappears (example below). In some areas the bar graph may 'bounce' up and down for a few seconds. If this occurs, simply wait for the bar graph to settle.

Below liquid level

Note: Some cylinders are prone to giving 'false levels';that is the bar graph may disappear after moving the sensor even though the Liquid Level has not been passed. If you think you may have found a false Liquid Level, simply move the sensor slightly to the left or right to check if the bar graph returns, as false levels can usually be caused by irregularities in a specific part of the steel wall.

Step 6: Move sensor back up the cylinder in smaller steps until the bar graph rises again. The position of the sensor on the wall of the cylinder at this point is the Liquid Level position inside the cylinder. **You have found the Liquid Level.**

Note: For increased accuracy, it is possible to move the sensor in very small steps further up or down to find the position where the bar graph settles in the middle of its range (neither full or empty). At this point, the Liquid Level can be identified at the position of the exact middle of the sensor with an uncertainty of ±1.5mm.

IF YOU ENCOUNTERED DIFFICULTY USING PROCEDURES 1 OR 2 PLEASE MOVE ONTO TROUBLE SHOOTING ON PAGE 14.

PROCEDURE 2: TO BE USED WHERE HIGHER READINGS ARE FOUND IN THE LIQUID PHASE COMPARED TO THE GAS PHASE.

Step 1: Place a strip of gel or water down the vertical strip on the cylinder you chose during CYLINDER PREPARATIONS.

Step 2: Place the sensor on the area covered with gel or water and on the LOWER portion of the cylinder, where you are certain the sensor will be below the Liquid Level. DO NOT place the sensor close to the weld or very close to the bottom of the cylinder, as anomalous readings will be found.

Note: The sensor must always be positioned with the 'TOP' marking positioned pointing exactly upwards. On some sensors the 'TOP' is marked by a simple dot. If the sensor is not accurately placed the right way up, then anomalous readings will be found.

Step 3: Once location has been found, press CAL. A full bar graph will appear on the Portalevel® screen, example below:

Below liquid level

Calibration must be carried out for each individual cylinder tested.

Step 4: Move sensor 5cm up, observing the bar graph.

Note:When moving the sensor, it is important NOT to slide it, as this will damage the sensor pad, rendering the sensor inefficient and inaccurate. Remove the sensor fully and replace in steps each time you move the sensor.

Step 5: Repeat Step 4 until the bar graph reduces and disappears (example below). In some areas the bar graph may 'bounce' up and down for a few seconds. If this occurs, simply wait for the bar graph to settle.

Above liquid level

Note: Some cylinders are prone to giving 'false levels', that is the bar graph may disappear after moving the sensor even though the Liquid Level has not been passed. If you think you may have found a false Liquid Level, simply move the sensor slightly to the left or right to check if the bar graph returns, as false levels can usually be caused by irregularities in a specific part of the steel wall.

Step 6: Move sensor back down the cylinder in smaller steps until the bar graph rises again. The position of the sensor on the wall of the cylinder at this point is the Liquid Level position inside the cylinder. **You have found the Liquid Level.**

Note: For increased accuracy, it is possible to move the sensor in very small steps further up or down to find the position where the bar graph settles in the middle of its range (neither full or empty). At this point, the Liquid Level can be identified at the position of the exact middle of the sensor with an uncertainty of ±1.5mm.

IF YOU ENCOUNTERED DIFFICULTY USING PROCEDURES 1 OR 2 PLEASE MOVE ONTO TROUBLE SHOOTING ON PAGE 13

Troubleshooting

ISSUE 1: "The readings on the main unit did not change when the sensor was placed anywhere on the cylinder"

SOLUTION: Firstly, ensure you are using an adequate quantity of water or gel to couple the sensor to the cylinder and also ensure that the rubber pad of the sensor is clean and undamaged.

If this does not solve the problem, carry out the DIP Test and the FUNCTION Test found in section 2.2, page 7. If the sensor fails the DIP Test or the main unit fails the FUNCTION Test then contact service@sdfire.com as the equipment is likely malfunctioning.

ISSUE 2: "The readings fluctuate greatly even with the sensor repeatedly placed on the same side of the Liquid Level." / "Readings on the main unit increase the longer the sensor is left on the cylinder."

Some fluctuation in the reading is normal when working with this and any other ultrasonic equipment. If the variation is extreme, ensure the end of the sensor and the area of the cylinder you are testing are clean and free of debris and chipped paint.

You can expect the readings to rise once you have placed the sensor on cylinder, especially when using the gel couplant. This rising of the reading values is caused by a few separate factors, but does not prevent accurate Liquid Level detection. To reduce the impact of this effect, try to keep the sensor on the cylinder for roughly the same amount of time for every step up or down the cylinder you take with the sensor.

If the readings fluctuate more than ±100% when the sensor is left in one location then please contact service@sdifire.com

ISSUE 3: "Readings are rarely/never greater than 1000 on the side of the level where the highest readings are found."

SOLUTION: The Portalevel® Max should, in most scenarios, be able to attain readings of more than 1000 on a cylinder. Achieving readings less than 1000 **DOES NOT** always prevent measurement, but in some cases may cause problems. If you are having problems making a measurement:

Step 1: Clean surface of cylinder with damp cloth to remove dirt, debris, flaking paint and rust. Choose a vertical strip on the cylinder which has the most consistently smooth surface, top to bottom. Use this strip to place the sensor on for testing.

Step 2: Ensure you are using either gel or water to couple the sensor to the cylinder. Be aware that especially in hot environments, water quickly evaporates from the surface of a cylinder, so in this case use gel. Also check the end of the sensor for damage to the rubber sensor pad, and clean lightly with a damp cloth if necessary.

If the above steps still do not fix the problem, try some of the additional solutions below.

Step 3: Replace the batteries on the main unit (see page 26). Low power can often significantly reduce the measurement readings seen on the unit.

Step 4: Engage SPA by pressing the SPA button. This will boost power to the sensor and is useful for dealing with dirty, rusty or damaged cylinders. SPA will not correct the problem however if the battery power is already low. There are four SPA settings, each of greater power than the last. Use the lowest SPA setting which gives you values of at least 1000, and then continue with testing.

SPA 1 Engaged

If these steps do not rectify the issue then please contact service@sdifire.com

ISSUE 4: "The bar graph does not fill up, even with CAL engaged"

SOLUTION: The bar graph will only fill up if very high readings are found without CAL engaged, or once CAL is engaged and the current reading is significantly larger than the value displayed when CAL was pressed. If you cannot get the bar graph to fill up:

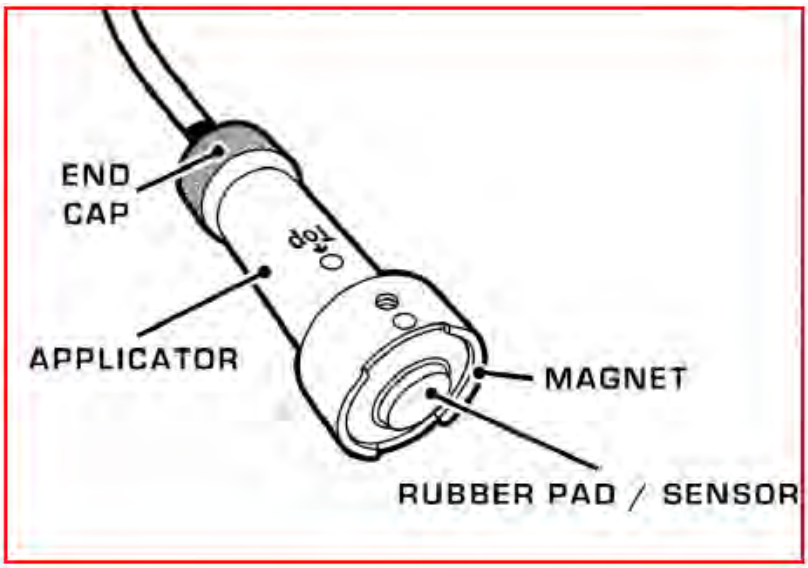
Step 1: Use the DIP Test (Section 2.2, page 7) to check the sensor and main unit is working correctly. During the DIP Test the bar graph should light up entirely.

Step 2: Replace the battery on the main unit (see page 26). Low power can often significantly reduce the measurement readings seen on the unit.

Step 3: If neither of the above steps solves the problem, contact service@sdifire.com as it is likely a technical fault.

ISSUE 5: "Debris/gel in sensor housing has caused the sensor mechanism to stick making it hard to use."

SOLUTION: The sensor can be removed from its housing and cleaned following the below steps.



Step 1: Hold sensor in left hand with dot/top facing up. With right hand, unscrew rear cap completely by twisting anticlockwise.

Step 2: Once the rear cap is unscrewed, gently pull out the sensor and spring by pulling on the cable.

Step 3: With a damp cloth, clean the various parts, taking extra care on the sensor itself, the spring, and the inside of the housing/around the magnet**. Ensure all components are dried before continuing, as rusting can occur.**

Step 4: To reassemble, slide sensor back into the applicator housing whilst twisting gently so the sensor seats itself into the guide rail inside the housing. This rail ensures the sensor remains the right way up inside the housing. Then push in the sensor until it stops and screw the rear cap back on.

Step 5: If these steps do not rectify the issue then please contact service@sdifire.com

ISSUE 6: "There is not a significant difference between above and below level readings"

Step 1: Carry out a 'Calibration Procedure Identification' (CPI) explained in Section 2.3, page 9.

Step 2: Upon completing Step 1 press CAL on the exact location where the highest readings are found.

Step 3: Continue to test as normal.

Step 4: If this still does not rectify the problem, engage SPA 1 and retest. If the Liquid Level still cannot be found, proceed to SPA 2 and SPA 3 and retest.

Step 5: If this does not rectify the problem, please contact service@sdifire.com

Frequently Asked Questions

Why do I have to use water or gel with the sensor?

The use of water or ultrasonic couplant gel is *essential* to the operation of a Portalevel® unit. When the sensor both emits a high energy pulse and listens for the retuning echoes, excellent mechanical contact must be maintained between the senor and the container in order for the ultrasonic signals to pass into and out of the container efficiently and without interference. This is done by placing a thin layer of gel or water between the sensor and container wall, which omits all air from the contact area, ensuring good operating conditions. If no water or gel is used then the ultrasonic signal can be broken up or even destroyed when traveling between the container and the sensor, making taking measurements impossible.

What does SPA stand for and what does it do?

Under some conditions, even if you are using gel or water between the sensor and the container wall, some of the ultrasonic signal can still be lost. This may be because the internal or external walls are heavily rusted or corroded or maybe some part of the cylinder or liquid inside is especially good at absorbing ultrasound. To overcome this Signal Power Amplification (S.P.A.) can be engaged which boosts the output power of the Portalevel® allowing stronger ultrasonic pulses to be emitted and stronger pulses to be received allowing a measurement to be made.

What does the digital reading mean?

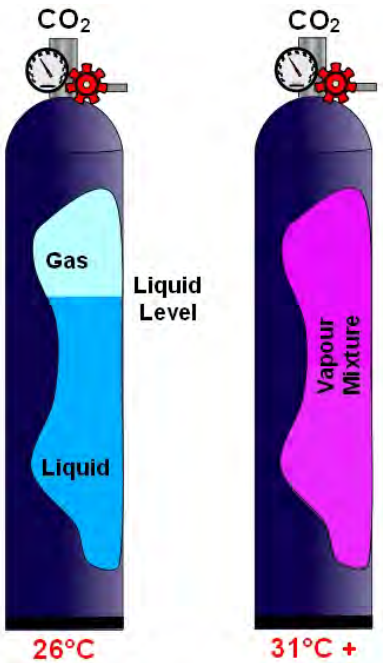
The digital display on the Portalevel® units represents the strength of the returning echoes and once the Portalevel® is calibrated to an area of the cylinder where high readings are found, the sensor can be moved up and down the container in order to find the exact location where the transition from liquid to gas contents is found. The exact operating procedure to be used is explained in detail in Chapter 2.

Why can't I test CO_2 and FE-13 in high temperatures?

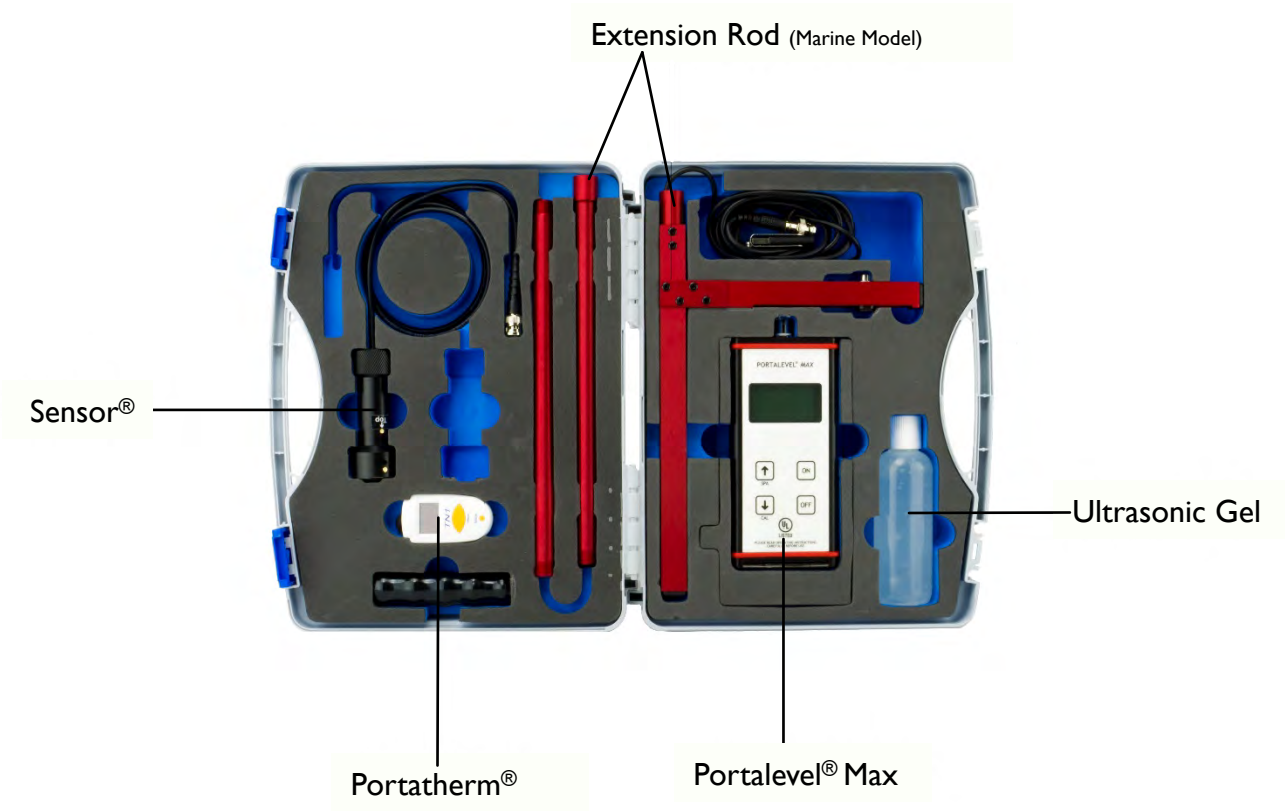
When testing some liquids, it is vital that testing is done under atmospheric temperatures lower than their *critical temperature*. At the critical temperature of a liquid, it transforms into a vapourous state in which a liquid level no longer exists inside the container to be measured. NOVEC 1230 has a critical temperature of 168.7 °C and as such testing is never practically limited by this, but some commonly tested liquids have low critical temperatures. CO_2, carbon dioxide, has a critical temperature of 31 °C and FE-13 has a critical temperature of 26 °C. Whilst this can prove problematic in especially hot climates, there are several methods in which this can be overcome:

- Running fresh water lines across cylinders to act as a heat exchanger
- Use of portable AC units
- Use of bagged ice around cylinders to cool them
- Testing both early and late in the day.

Testing these gases at the coolest temperature achievable will allow for the most accurate and efficient results.
It is also important to note that agitating cylinders of FE-13 can also cause a change in the liquid level due to the physical properties of FE-13. It is possible that agitating cylinders can cause more FE-13 to be in the vapour phase than expected at a given temperature, this results in a lower liquid level reading than is the case. It is recommended that FE-13 cylinders are left at rest for a few hours before testing to avoid inaccurate liquid level measurement.



3. Accessories



Portalevel® Max in carry case with accessories

Extension rod (Extra)

The Portalevel® extension rods are primarily developed for use in the marine industry and as such come as standard with the Portalevel® Max Marine (not with the Portalevel® Max). However practically, they can be used in any environment with multiple banked rows of cylinders to allow easy liquid level detection two or even three rows back.

We manufacture and supply two models of extension rod, but both are assembled and used in the same way (see overleaf).

The extension rod (Figure 3) sections simply screw together, with the sensor at one end (F) and the handle at the other (D). The cable connecting the sensor to the main unit (B) threads through the hollow sections and out of the handle to avoid tangling. Using the adjustment nut and an Alan key, the sensor (F) can be loosened and slid horizontally along the adjustment rail (G). This allows the sensor to be positioned so it contacts the cylinder flatly when being used. A printed ruler guide on the adjustment rail allows accurate positioning of the sensor, and it should be positioned at a value which is equal to the radius (half the diameter) of the cylinders to be measured.
Once this setup is complete, the BNC connector (A) can be connected to the Portalevel® main unit and can be used using the same procedure as a normal sensor.

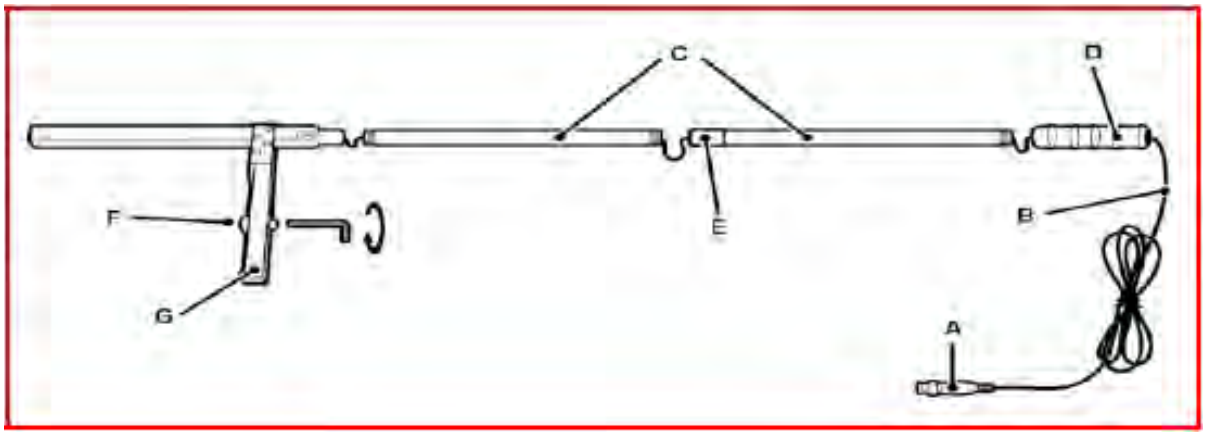
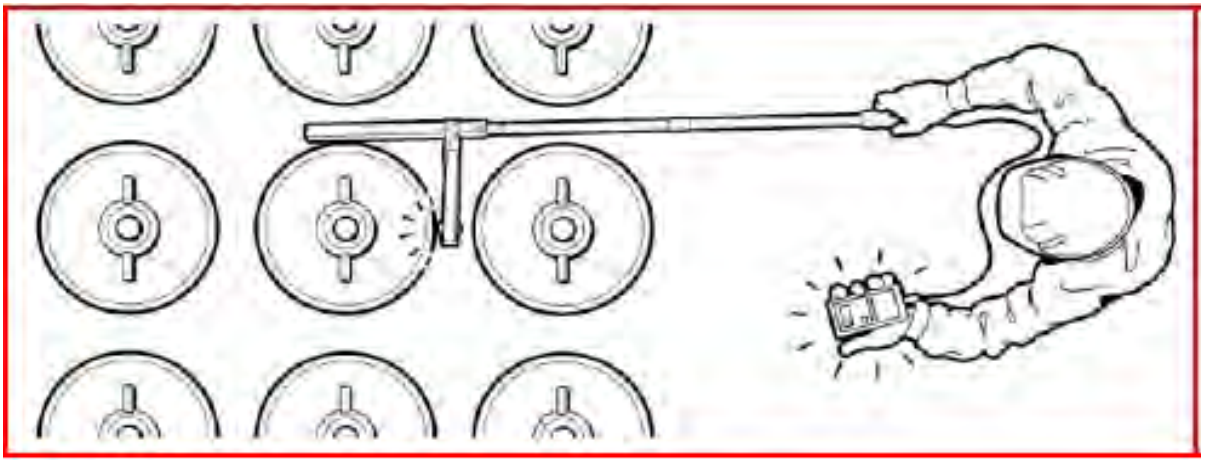


Figure 3



Example of an extension rod being used

Portatherm® (Optional Extra)

Portatherm® is an easy to use infrared thermometer which allows easy checking of a cylinders temperature prior to testing. This is useful when testing agents such as Carbon Dioxide or FE 13 in hot climates, which cannot be tested above their critical temperature.
See page 20 in Frequently Asked Questions for more information about this.

Operation

Aim the thermometer at the target and press the 'measure' button. The instrument should be as close to the target as possible to achieve an accurate measurement (within 2.50 cm if possible).

Mode Button

The instrument must first be turned on by pressing the 'measure' button before the mode can be changed.

1 Press - Minimum temperature: Pressing the mode button once, confirmed by then pressing the measure button will measure the minimum temperature when the measure button is pressed again.

2 Presses – Maximum temperature: Pressing the mode button twice, confirmed by then pressing the measure button will measure the maximum temperature when the measure button is pressed again.

3 Presses - Lock: Pressing the mode button three times, confirmed by then pressing the measure button again, will continually measure the temperature for 60 minutes when the measure button is pressed. This can be shortened by pressing the measure button again.

4 Presses – °C/°F: Pressing the mode button four times, confirmed by then pressing the measure button, will change the device between measuring in Celsius and Fahrenheit.

Errors

Er2: This message is displayed when the device is exposed to rapid changes in temperature – the thermometer needs approximately 30 minutes to stabilise to a certain room temperature

Er3: This message is displayed when the thermometer is outside it's specified measuring range of 14°F to 122 °F – the thermometer will not be able to measure the temperature in these environments.

Er5-9: Reset the thermometer – turn it off, remove the batteries, wait 1 minute, reinsert batteries and turn the thermometer back on.

Low Battery: This is represented by an icon. Turn the unit off and replace the batteries with 2 x AAA batteries. **Ensure the unit is off before replacing batteries.**

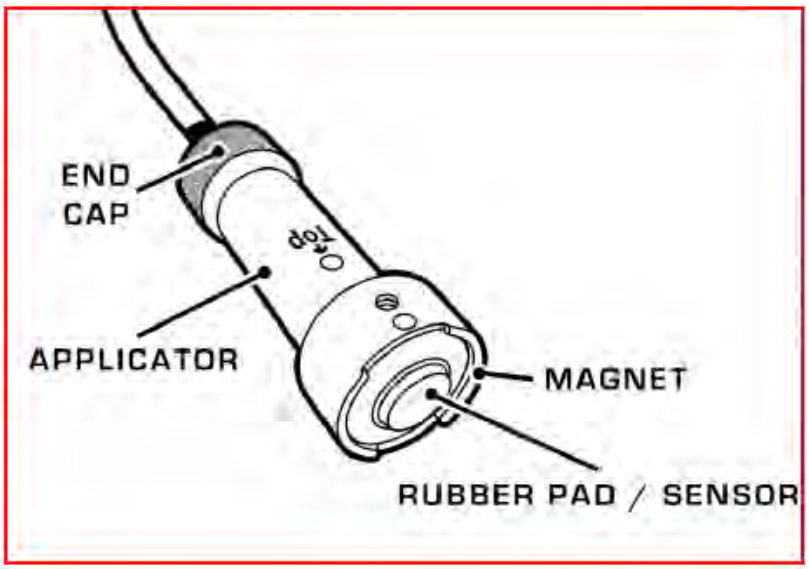
Cleaning: Clean the thermometer lens with a soft cloth or cotton swab and water/ medical alcohol. Never submerge the thermometer and allow it to fully dry before using it again. The thermometer should not be stored outside its measurement range of 14 °F to 122 °F.

Ultrasonic Gel

The ultrasonic gel or couplant can be used instead of water if the user intends to test a cylinder for a reasonably long period of time, if the ambient temperature is very hot, or if the site does simply not allow open containers of water (data server rooms for example).

The couplant dries out much more slowly than water alone and is more viscous, allowing continuous testing in hot environments and little mess as it sticks to the container only.

Portalevel® Sensors



Portalevel® sensors are single crystal piezoelectric sensors which both emit and receive the ultrasound that the Portalevel® uses to detect a liquid level. Whilst the sensors are designed to be rugged, they must be properly maintained in order to maximise their lifetime. The two most critical points are to always dry the end of the sensor after use to prevent rusting and to treat the rubber pad with care as damage or scratches can significantly reduce the sensor's effectiveness.

4. Maintenance

This section contains instructions on how to maintain the equipment to extend its lifetime as long as possible. Maintenance of the equipment is simple and only requires the cleaning of the sensor. For any major works or re-calibrations the unit can be returned to the manufacturer for repairs.

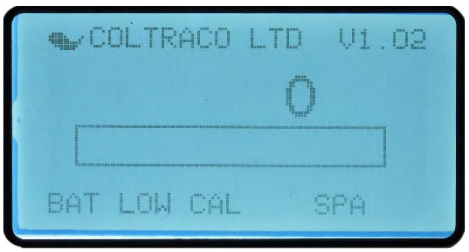
Sensor Care

The ultrasonic sensor is the most delicate part of a Portalevel® and care must be taken when using it. The sensor is robust, but damage may occur if it is dropped, or if the sensor is dragged across the surface of the steel rather than being removed and replaced in steps. The rubber pad on the end of the sensor is designed to protect the face of the transducer inside, so care must be taken to avoid scratching or damaging this pad to allow the sensor to work efficiently.

After using a Portalevel®, it is essential that the end of the sensor is dried off, regardless if water or gel is used. If not dried after use, the magnet is likely to rust and the spring mechanism may jam if gel dries internally. If the spring mechanism does jam, it can be cleared by unscrewing the endcap (p)of the sensor, removing the mechanism from inside, and carefully cleaning the transducer and sensor. When replacing the internal mechanism, the groove along the top of the transducer must be aligned with the groove on the inside of the sensor housing, otherwise it will not reassemble correctly.

Battery Care

The Portalevel® Max has an indicator bottom left of the LCD screen, which shows up black when the battery is low.



When the battery low indicator is displayed, the battery must be replaced before it is used further, or the unit may provide anomalous results. To replace the battery follow the instructions overleaf.

Battery Replacement

You will need a small flathead screwdriver and a 9V alkaline type 6LR61 Battery.

Step 1: Ensure the unit is off and turn the unit so that the front fascia faces downwards.

Step 2: Take a small, flat head screwdriver and insert it into the slit at the bottom of the back side of the unit.

Step 3: Lever the screwdriver gently until the battery hatch pops open.

Step 4: Use screwdriver to open the internal battery compartment.

Step 5: Remove old battery and replace with new, taking care to connect + and – correctly.

Step 6: Close battery cover, ensuring that the wires are not trapped.

Step 7: Press Battery hatch until it clicks into place.

Storage

When a Portalevel® unit is going to be stored, or not used for a long period of time, remove the battery from the main unit to prevent corrosion damage to the unit. This will also prolong battery life.

5. Training

This section is for new or untrained users, or for users who may need to remind themselves of how to operate a Portalevel®.

The positions of the particular controls for the Portalevel® Max are shown at the beginning of the manual in section 1.2, page 4, and the names and functions of Portalevel® Max accessories are shown in section 4, page 21.

The main purpose of this short guide is to explain the BENCH Test and also to direct users towards the resources in section 6, which includes further help and videos showing how to use the Portalevel® Max on different cylinders.

The BENCH Test:

The purpose of the BENCH Test it to familiarise users with the Portalevel® in a simple testing environment, before moving onto testing real cylinders which can be more challenging.

To perform the BENCH Test, you will need:

The Portalevel® unit on which you are to be trained.
The included ultrasonic gel or a container of water to use as couplant.
A large container, half full of water, to simulate a pressurised cylinder.

A metal (ideally magnetic) container works best, though a hard plastic container will still work. The shape of the container is not particularly important, as long as its outside surface is smooth enough for the sensor to be cleanly pressed against it, and it is tall enough for the sensor moved up and down in steps of a few centimetres.

The BENCH Test is very easy to perform. Simply follow the steps on the following pages, where you will use the Portalevel® Max to detect the water Liquid Level in your chosen large container, and in the process you will familiarise yourself with the basic procedure of using a Portalevel®.

The BENCH Test:

Step 1: Connect the sensor to the Portalevel® unit and turn the unit on.

Step 2: Choose a vertical strip of your large container which is as continuously smooth as possible, free of chips, rust or any other kind of damage. Apply water or the ultrasonic gel along the length of this chosen vertical strip.

Step 3: With all Portalevel® testing, you must first find where on the cylinder you find, in general, the highest digital readings: above the Liquid Level or below the Liquid Level. To do this, place the sensor at the top of the chosen vertical strip (see note below), and take note of the reading the Portalevel® main unit displays. Then move the sensor down in a step roughly 5cm (2 inches), and make another note of the value the main unit reads. Once you have reached the bottom of the vertical strip, ask yourself: In general, where did I find the highest readings?

Note: The sensor must always be positioned with the 'TOP' marking positioned pointing exactly upwards. On some sensors the 'TOP' is marked by a simple dot. If the sensor is not accurately placed the right way up, then anomalous readings will be found.

Step 4: You should have found the highest readings when the sensor was placed on an area of the large container which was **below** the water Liquid Level. When testing real cylinders, this test must be performed for each new type of cylinders, and you may find the highest readings above or below the Liquid Level. However, when testing water you should always find the highest readings below Liquid Level.

Step 5: Place the sensor on an area of the large container which is below the liquid level (You should see high readings on the display). Now press the CAL button on the unit to *calibrate* it to this particular container. **You should now see a full bar graph on the display of the unit.** When testing on any container or cylinder, you always calibrate the Portalevel® on the side of the Liquid Level which gives you the highest readings.

Step 6: Move the sensor back up the vertical strip of the cylinder, again in steps of roughly 5cm (2 inches), observing the bar graph each time you place the sensor onto the container wall. Be sure the vertical strip of wall you chose of the container is still well covered by whatever couplant (water or gel) you have chosen.

Step 7: As you progress up the wall of the container, the numerical readout on the Portalevel® unit will change and the bar graph might fluctuate slightly. However, the bar graph will only disappear entirely once you place the sensor on the container wall above the Liquid Level. Once you observe this, move the sensor back down the container in smaller steps, until the bar graph reappears. You have found the liquid level.

Note: For increased accuracy, it is possible to move the sensor in very small steps further up or down to find the position where the bar graph settles in the middle of its range (neither full or empty). At this point, the liquid level can be identified at the position of the exact middle of the sensor with an uncertainty of ±1.5mm.

PORTALEVEL® MINI

USER MANUAL

Contents

Note: For information on converting liquid levels to approximate agent weights, see the separate guide 'liquid level to Weight Conversion,' also on sdifire.com/support

1. Introduction and key features

What does the Portalevel® MINI do?

The Portalevel® MINI® is designed to be a portable way to non-invasively locate the liquid level inside any single skinned cylinder. Portalevel® MINIs are capable of detecting the presence of any liquid externally; from water and liquid pressurized gases to firefighting clean agents. Portalevel® MINIs can be used on a huge variety of container types, composed of different materials and of different shapes and sizes, but are typically most used on steel compressed gas cylinders.

Many applications exist for our technology, but it is most widely used as a replacement to both weighing fire suppression cylinders during installation and servicing, or the fitting of internal and invasive liquid level 'float' devices. Once the liquid height inside a container has been found, the contained weight of liquid can be determined, after taking into consideration other environmental factors such as the size of the cylinder and type of liquid.

The . Portalevel® MINI is capable of testing a wide variety of fire suppressant agents; CO2, FM200™, NOVEC 1230™, old Halon agents, FE-13™, FE-25™, NAF S III™ and all core Clean Agent Systems.

Portalevel® MINI

The Portalevel® MINI is specifically designed for use in environments which are hard to access or in dark environments where hands-free use is beneficial. With a calibration feature, two power settings, LED liquid level display and connectors for a neck strap, the Portalevel® MINI is ideally suited for the challenging environments, such as aboard vessels, where mobility is essential. Portalevel® MINI also includes a sensor and ultrasonic gel (couplant).

Neck strap clip: For hands free use

LED Bar: Easy to interpret visual reading

Gromit: The gromit at the bottom of the unit is the ultra secure simple fastening for the Sensor

LCD display: Numerical readings for experienced users to gauge a better interpretation of the ultrasound behavior

CAL: The CAL button is the standard procedure feature enabling self-calibration prior to testing on each individual cylinder, to ensure accurate and reliable readings.

SPA: The SPA capability enables an increased strength of signal output to achieve better readings for poor condition cylinders, more challenging applications and large volume uses.

On: Simple power ON button – powered by 4 x AA battery providing approximately 12 hours battery life

Off: Simple power OFF button – keep turned off to save battery life

How does a Portalevel® MINI **work?**

All sound is physical vibrations which move through a material, and in the case of the sound we are used to, the vibrations move through air. Ultrasound is the same as the sound we experience, but its frequency is beyond that which humans are capable of hearing. Whilst the highest frequency a human can hear is around 20,000 Hz, . Portalevel® MINI units use sound at a frequency of 1,000,000 Hz or 1 MHz.

All Portalevel® MINI devices use ultrasound in order to detect the presence of a liquid. In order to do this, the main unit sends a strong electrical signal to the sensor which then emits a high energy pulse of ultrasound into the container wall (Figure 1). The ultrasound is conducted through the solid walls of the container and then interacts with the contents. After the sensor stops emitting ultrasound, it starts listening for the returning echoes of the signal (Figure 2). It sends these back to the main unit, which then analyzes the returning signal in comparison to the calibration signal taken for each cylinder. This allows the Portalevel® MINI device to detect the presence or absence of liquid behind the area of the container wall where the sensor is placed.

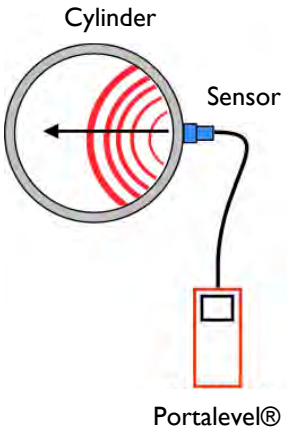


Figure 1

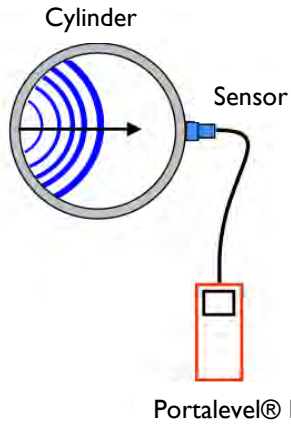


Figure 2

2. Operating Instructions

POINTS TO CONSIDER BEFORE PROCEEDING:

Do not proceed before reading section 1.

Do not proceed before familiarising yourself with the Training section on page 26.

Introduction

There are three basic procedures which must be carried out when using the . Portalevel® MINI :

1. Preparation: Function Tests and cylinder preparations. These tests ensure that the Portalevel® MINI equipment is functioning properly and that the cylinder(s) are prepared in a way to give the most accurate readings.

2. Calibration Procedure Identification (CPI): This test allows you to determine which method of testing should be used on the cylinders you wish to measure. Once you know the appropriate method of testing for that type of cylinder, you do not need to perform this again for that testing session.

3. Testing: After step two, you can follow the appropriate testing procedure (1 or 2) for that set of cylinders.

Note: If you move on to testing a different type of cylinder, which is a different size, weight or filled with a different agent, you must repeat step 2 on the new cylinder type to confirm which testing procedure is required.

As with all electronics, do to leave the Portalevel® MINI in the sun for long periods of time. Excessive UV exposure can lead to damage of the LCD screen.

DIP Test:

The DIP Test checks whether the sensor you are using is working correctly and is communicating with the Portalevel® MINI® main unit.

Step 1: Connect extension rod to unit and turn on.

Step 2: Lightly dip the tip of sensor into cup of water vertically. The amount of water in the cup is not important, as long as there is enough to dip the end of the sensor so the black central patch on the end of the senor is submerged, without it touching the bottom of the cup.

Step 3: When dipping the sensor, you should see the readings of the Portalevel® MINI spike to high values and the bar graph rise also. If you do observe this, then the DIP Test is complete and you know the sensor is working well.

CYLINDER PREPARATIONS:

It is important to prepare the cylinders well to attain accurate and reliable readings. To perform CYLINDER PREPARATIONS:

Step 1: Find on the cylinder the side which has the least damage, rust or chipped paint. For accurate testing you must find a vertical strip down the side of the cylinder which is as smooth as possible. You will be placing the sensor or extension rod and testing along this strip.

Step 2: Wipe down the chosen side of cylinder with damp cloth to remove dirt and debris. This completes the CYLINDER PREPARATIONS.

IF YOUR UNIT FAILS THE FUNCTION OR DIP TEST, PLEASE CONTACT SUPPORT AT 732-751-9266
SERVICE@SDIFIRE.COM

Temperature:

The surface temperature of the cylinders stored must be measured before the liquid levels are checked. This should be measured around half way up the cylinder.

IF THE TEMPERATURE EXCEEDS 86°F DO NOT TEST CO_2 or FE-13 CYLINDERS.

Further information regarding this issue can be found on page 21 under Frequently Asked Questions.

2. Calibration Procedure Identification (CPI)

The Purpose of this test is to identify whether method 1 or 2 should be used for the cylinder being tested. The details and differences between methods 1 and 2 are explained in the next section.

To perform CPI:

Step 1: Place a strip of gel or water down the vertical strip on the cylinder you chose during CYLINDER PREPARATIONS.

Step 2: Place sensor at top of cylinder (below top weld seam or curve). Take note of digital reading.

Step 3: Place sensor 5cm below. (Take note of digital reading).

Step 4: Repeat Step 3 down the full vertical length of the cylinder.

Step 5: Analyze the results using the guide below.

Compare your results to the guide below to decide whether Procedure 1 or Procedure 2 should be used when testing the cylinders you wish to measure.

INSTANCE 1: "Higher readings were found in the upper portion (gas area) of the cylinder compared with the lower portion (liquid area)." – Carry out Procedure 1.

INSTANCE 2: "Higher readings were found in the lower portion (liquid area) of the cylinder compared with the upper portion (gas area)." – Carry out Procedure 2.

INSTANCE 3: "There was no difference in readings between the upper portion and lower portion of the cylinder" – Carry out Procedure 2.

Both Procedure 1 and 2 are fully explained in the next section.

3. Testing

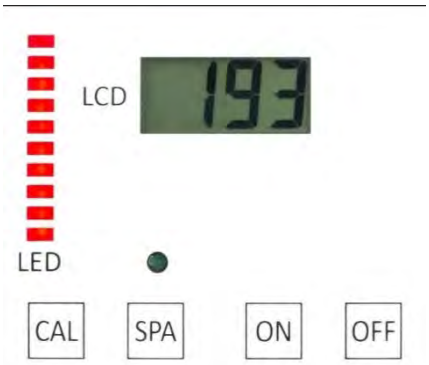
PROCEDURE 1: TO BE USED WHERE HIGHER READINGS ARE FOUND IN THE GAS PHASE COMPARED TO THE LIQUID PHASE.

Step 1: Place a strip of gel or water down the vertical strip on the cylinder you chose during CYLINDER PREPARATIONS.

Step 2: Place the sensor on the area covered with gel or water and on the UPPER portion of the cylinder, where you are certain the sensor will be above the liquid level. DO NOT place the sensor close to the upper weld or start of the dome, as anomalous readings will be found.

Note: The sensor must always be positioned with the 'TOP' marking positioned pointing exactly upwards. On some sensors the 'TOP' is marked by a simple dot. If the sensor is not accurately placed the right way up, then anomalous readings will be found.

Step 3: Once location has been found, press CAL. Readings must exceed a value of 100 in order for CAL to be engaged. A full bar graph will appear on the Portalevel®MINI screen, example below:

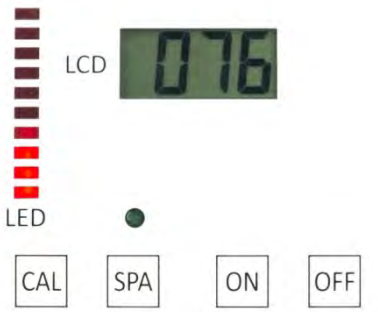


Above liquid level

Step 4: Move sensor 5cm down, observing the bar graph

Note: When moving the sensor, it is important NOT to slide it, as this will damage the sensor pad, rendering the sensor inefficient and inaccurate. Remove the sensor fully and replace in steps each time you move the sensor.

Step 5: Repeat Step 4 until the bar graph reduces and disappears (example below). In some areas the bar graph may 'bounce' up and down for a few seconds. If this occurs, simply wait for the bar graph to settle.



Below liquid level

Note: Some cylinders are prone to giving 'false levels', that is the bar graph may disappear after moving the sensor even though the liquid level has not been passed. If you think you may have found a false liquid level, simply move the sensor slightly to the left or right to check if the bar graph returns, as false levels can usually be caused by irregularities in a specific part of the steel wall.

Step 6: Move sensor back up the cylinder in smaller steps until the bar graph rises again. The position of the sensor on the wall of the cylinder at this point is the liquid level position inside the cylinder. **You have found the liquid level.**

Note: For increased accuracy, it is possible to move the sensor in very small steps further up or down to find the position where the bar graph settles in the middle of its range (neither full or empty). At this point, the liquid level can be identified at the position of the exact middle of the sensor with an uncertainty of ±1.5mm.

IF YOU ENCOUNTERED DIFFICULTY USING PROCEDURES 1 or 2 PLEASE MOVE ONTO TROUBLE SHOOTING ON PAGE 15.

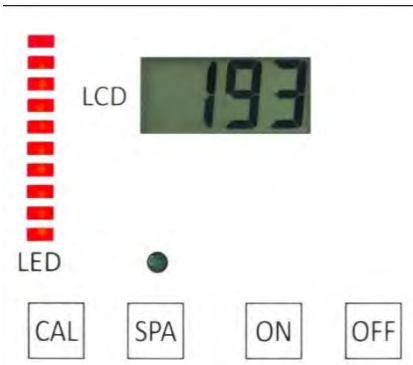
PROCEDURE 2: TO BE USED WHERE HIGHER READINGS ARE FOUND IN THE LIQUID PHASE COMPARED TO THE GAS PHASE.

Step 1: Place a strip of gel or water down the vertical strip on the cylinder you chose during CYLINDER PREPARATIONS.

Step 2: Place the sensor on the area covered with gel or water and on the LOWER portion of the cylinder, where you are certain the sensor will be below the liquid level. DO NOT place the sensor close to the weld or very close to the bottom of the cylinder, as anomalous readings will be found.

Note: The sensor must always be positioned with the 'TOP' marking positioned pointing exactly upwards. On some sensors the 'TOP' is marked by a simple dot. If the sensor is not accurately placed the right way up, then anomalous readings will be found.

Step 3: Once location has been found, press CAL. Readings must exceed a value of 100 in order for CAL to be engaged. A full bar graph will appear on the Portalevel® MINI screen, example below:



Below liquid level

Step 4: Move sensor 5cm up, observing the bar graph

Note:When moving the sensor, it is important NOT to slide it, as this will damage the sensor pad, rendering the sensor inefficient and inaccurate. Remove the sensor fully and replace in steps each time you move the sensor.

Step 5: Repeat Step 4 until the bar graph reduces and disappears (example below). In some areas the bar graph may 'bounce' up and down for a few seconds. If this occurs, simply wait for the bar graph to settle.

Above liquid level

Note: Some cylinders are prone to giving 'false levels', that is the bar graph may disappear after moving the sensor even though the liquid level has not been passed. If you think you may have found a false liquid level, simply move the sensor slightly to the left or right to check if the bar graph returns, as false levels can usually be caused by irregularities in a specific part of the steel wall.

Step 6: Move sensor back down the cylinder in smaller steps until the bar graph rises again. The position of the sensor on the wall of the cylinder at this point is the liquid level position inside the cylinder. **You have found the liquid level.**

Note: For increased accuracy, it is possible to move the sensor in very small steps further up or down to find the position where the bar graph settles in the middle of its range (neither full or empty). At this point, the liquid level can be identified at the position of the exact middle of the sensor with an uncertainty of ±1.5mm.

IF YOU ENCOUNTERED DIFFICULTY USING PROCEDURES 1 or 2 PLEASE MOVE ONTO TROUBLESHOOTING ON PAGE 15.

Troubleshooting

ISSUE 1: "The readings on the main unit did not change when the sensor was placed anywhere on the cylinder"

SOLUTION: Firstly, ensure you are using an adequate quantity of water or gel to couple the sensor to the cylinder and also ensure that the rubber pad of the sensor is clean and undamaged.

If this does not solve the problem, carry out the DIP Test and the FUNCTION Test found in section 2, page 8 and page 9. If the sensor fails the DIP Test or the main unit fails the FUNCTION Test then contact service@sdifire.com as the equipment is likely malfunctioning.

ISSUE 2: "The readings I see vary greatly on the side of the level where the highest readings are found – I can't tell where exactly to calibrate."

SOLUTION: With cylinders which present large fluctuations in readings, even when not crossing the liquid level, it may be correct to use a *'Reverse Calibration Mode'*. Some cylinders are more prone to naturally giving large variations in readings than others, but the *'Reverse Calibration Method'* can help minimize the possibility of detecting false liquid levels.

Step 1: Place a strip of gel or water down the vertical strip on the cylinder you chose during CYLINDER PREPARATIONS.

Step 2: Carry out CALIBRATION PROCEDURE IDENTIFCATION (Section 2, page 10), to identify which side of the liquid level you should *traditionally* calibrate on.

Step 3: Now, opposite to the normal method, place sensor on the side of the level where the **LOWEST** readings are found.

Step 4: Now engage SPA on the main unit (green indicator light will turn on).

Step 6: Now press CAL, followed by pressing SPA again to disengage (green indicator light should now be off again).

Step 7: Now move the sensor to the side of the level where the **HIGHEST** readings are found (full LED bar graph should appear) and work towards the opposing side in steps until the LED bar graph reduces and disappears.

Step 8: Move sensor back along cylinder in smaller steps until the bar graph rises again. The position of the sensor on the wall of the cylinder at this point is the liquid level position inside the cylinder. **You have found the liquid level.**

ISSUE 3: "Readings are rarely/never greater than 100 on the side of the level where the highest readings are found – The unit cannot be calibrated (CAL)."

SOLUTION: The Portalevel® MINI has a reading threshold of 100, below which they cannot be calibrated. This is to prevent the unit being operated incorrectly and giving false liquid levels.

Step 1: Clean surface of cylinder with damp cloth to remove dirt, debris, flaking paint and rust. Choose a vertical strip on the cylinder which has the most consistently smooth surface, top to bottom. Use this strip to place the sensor on for testing.

Step 2: Ensure you ae using either gel or water to couple the sensor to the cylinder. Be aware that especially in hot environments, water quickly evaporates from the surface of a cylinder, so in this case use gel. Also check the end of the sensor for damage to the rubber sensor pad, and clean lightly with a damp cloth if necessary.

If the above steps still do not fix the problem, try some of the additional solutions below.

Step 3: Replace the batteries on the main unit (See page 19). Low power can often significantly reduce the measurement readings seen on the unit.

Step 4: Engage SPA. This will boost power to the sensor and is useful for dealing with dirty, rusty or damaged cylinders. SPA will not correct the problem however if the battery power is already low.

Step 5: Trial 'Reverse Calibration Procedure' explained in the solution of ISSUE 3 above.

If these steps do not rectify the issue then please contact service@sdifire.com

ISSUE 4: "The LED bar graph does not light up"

SOLUTION: The LED bar graph will only light up if very high readings are found without CAL engaged, or once CAL is engaged whilst the unit reads a value greater than 100 (See ISSUE 3 if you cannot find readings greater than 100). If the LED bar graph does not light up even after CAL is engaged at a reading value greater than 100:

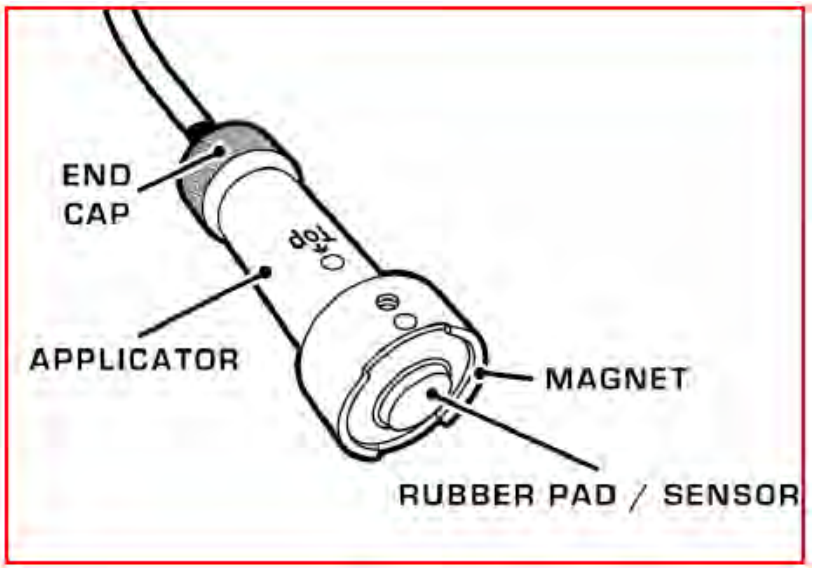
Step 1: Use the DIP Test (page 9) to check the sensor and main unit is working correctly. During the DIP Test the LED bar graph should light up entirely.

Step 2: Replace the batteries on the main unit (page 18). Low power can often significantly reduce the measurement readings seen on the unit.

Step 3: If neither of the above steps solves the problem, contact service@sdifire.com as it is likely a technical fault.

ISSUE 5: "Debris/gel in sensor housing has caused the sensor mechanism to stick making it hard to use."

SOLUTION: The sensor can be removed from its housing and cleaned following the below steps.



Step 1: With a damp cloth, clean the various parts, taking extra care on the sensor itself, the spring, and the inside of the housing/around the magnet**. Ensure all components are dried before continuing, as rusting can occur.**

Step 2: If these steps do not rectify the issue then please contact service@sdifire.com

ISSUE 6: "The display values do not rest at or close to 0 (a value of 5 or more) after the unit it turned on, with the sensor connected but not placed on a cylinder."

SOLUTION: This is a technical fault with the sensor, please contact technical support at service@sdifire.com

Frequently Asked Questions

Why do I have to use water or gel with the sensor?

The use of water or ultrasonic couplant gel is *essential* to the operation of a Portalevel® MINI unit. When the sensor both emits a high energy pulse and listens for the retuning echoes, excellent mechanical contact must be maintained between the senor and the container in order for the ultrasonic signals to pass into and out of the container efficiently and without interference. This is done by placing a thin layer of gel or water between the sensor and container wall, which omits all air from the contact area, ensuring good operating conditions. If no water or gel is used then the ultrasonic signal can be broken up or even destroyed when traveling between the container and the sensor, making taking measurements impossible.

What does SPA stand for and what does it do?

Under some conditions, even if you are using gel or water between the sensor and the container wall, some of the ultrasonic signal can still be lost. This may be because the internal or external walls are heavily rusted or corroded or maybe some part of the cylinder or liquid inside is especially good at absorbing ultrasound. To overcome this Signal Power Amplification (S.P.A) can be engaged which boosts the output power of the Portalevel® MINI allowing stronger ultrasonic pulses to be emitted and stronger pulses to be received allowing a measurement to be made.

What does the digital reading mean?

The digital display on the Portalevel® MINI units represents the strength of the returning echoes, and once the Portalevel® MINI is calibrated to an area of the cylinder where high readings are found, the sensor can be moved up and down the container in order to find the exact location where the transition from liquid to gas contents is found.

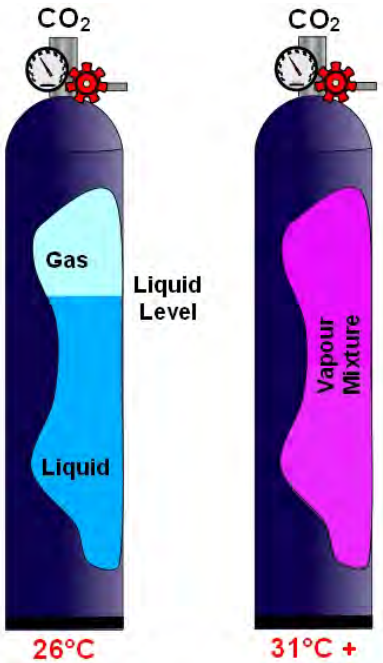
Why can't I test CO_2 and FE-13 in high temperatures?

When testing some liquids, it is vital that testing is done under atmospheric temperatures lower than their *critical temperature*. At the critical temperature of a liquid, it transforms into a vaporous state in which a liquid level no longer exists inside the container to be measured. NOVEC 1230 has a critical temperature of 168.7 °C and as such testing is never practically limited by this, but some commonly tested liquids have low critical temperatures. CO_2, carbon dioxide, has a critical temperature of 31 °C and FE-13 has a critical temperature of 26 °C. Whilst this can prove problematic in especially hot climates, there are several methods in which this can be overcome:

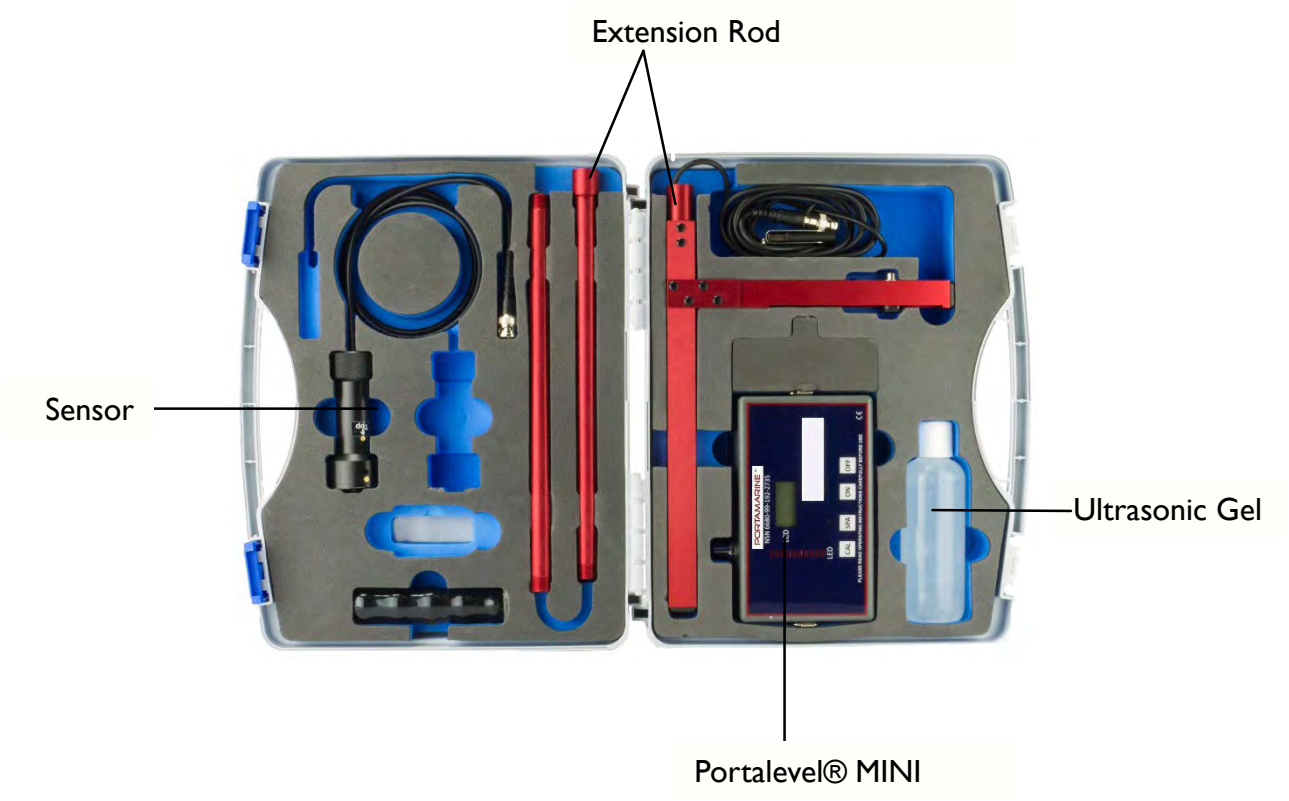
- Running fresh water lines across cylinders to act as a heat exchanger
- Use of portable AC units
- Use of bagged ice around cylinders to cool them
- Testing both early and late in the day.

Testing these gases at the coolest temperature achievable will allow for the most accurate and efficient results.

It is also important to note that agitating cylinders of FE-13 can also cause a change in the liquid level due to the physical properties of FE-13. It is possible that agitating cylinders can cause more FE-13 to be in the vapor phase than expected at a given temperature, this results in a lower liquid level reading than is the case. It is recommended that FE-13 cylinders are left at rest for a few hours before testing to avoid inaccurate liquid level measurement.



3. Accessories



A Portalevel® MINI shown in its carry case. Ultrasonic gel, sensor and extension rod extension rod sold separately

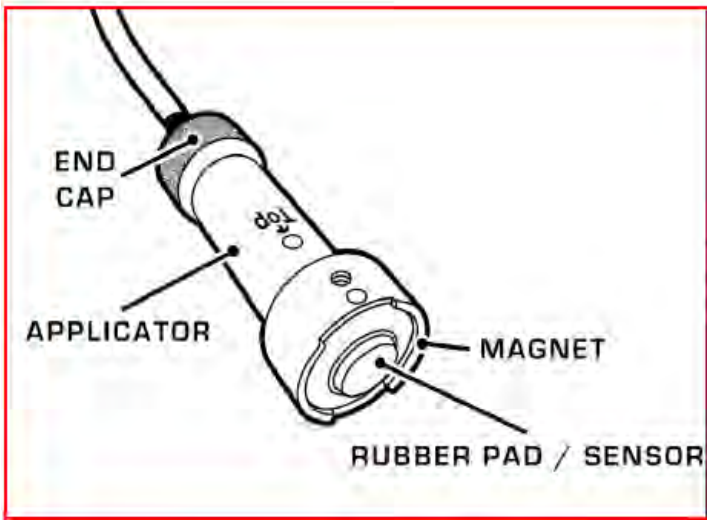
Ultrasonic Gel

The ultrasonic gel or couplant can be used instead of water if the user intends to test a cylinder for a reasonably long period of time, if the ambient temperature is very hot, or if the site does simply not allow open containers of water (data server rooms for example).

The couplant dries out much more slowly than water alone and is more viscous, allowing continuous testing in hot environments and little mess as it sticks to the container only.

Portalevel® MINI Sensor

Portalevel® MINI sensors are single crystal piezoelectric sensors which both emit and receive the ultrasound that the Portalevel® MINI uses to detect a liquid level. Whilst the sensors are designed to be rugged, they must be properly maintained in order to maximise their lifetime. The two most critical points are to <u>always</u> dry the end of the sensor after use to prevent rusting and to treat the rubber pad with care as damage or scratches can significantly reduce the sensor's effectiveness.



Portatherm® (Optional Extra)

Portatherm® is an easy to use infrared thermometer which allows easy checking of a cylinders temperature prior to testing. This is useful when testing agents such as Carbon Dioxide or FE 13 in hot climates, which cannot be tested above their critical temperature.
See page 21 in Frequently Asked Questions for more information about this.

Operation

Aim the thermometer at the target and press the 'measure' button. The instrument should be as close to the target as possible to achieve an accurate measurement (within 2.50 cm if possible).

Mode Button

The instrument must first be turned on by pressing the 'measure' button before the mode can be changed.

1 Press - Minimum temperature: Pressing the mode button once, confirmed by then pressing the measure button will measure the minimum temperature when the measure button is pressed again.

2 Presses – Maximum temperature: Pressing the mode button twice, confirmed by then pressing the measure button will measure the maximum temperature when the measure button is pressed again.

3 Presses - Lock: Pressing the mode button three times, confirmed by then pressing the measure button again, will continually measure the temperature for 60 minutes when the measure button is pressed. This can be shortened by pressing the measure button again.

4 Presses – °C/°F: Pressing the mode button four times, confirmed by then pressing the measure button, will change the device between measuring in Celsius and Fahrenheit.

Errors

Er2: This message is displayed when the device is exposed to rapid changes in temperature – the thermometer needs approximately 30 minutes to stabilise to a certain room temperature.

Er3: This message is displayed when the thermometer is outside it's specified measuring range of 14°F to 122°F – the thermometer will not be able to measure the temperature in these environments.

Er5-9: Reset the thermometer – turn it off, remove the batteries, wait 1 minute, reinsert batteries and turn the thermometer back on.

Low Battery: This is represented by an icon. Turn the unit off and replace the batteries with 2 x AAA batteries. **Ensure the unit is turned off before replacing batteries.**

Cleaning: Clean the thermometer lens with a soft cloth or cotton swab and water/medical alcohol. Never submerge the thermometer and allow it to fully dry before using it again. The thermometer should not be stored outside its measurement range of 14°F to 122°F.

4. Maintenance

This section contains instructions on how to maintain the equipment to extend its lifetime as long as possible. Maintenance of the equipment is simple and only requires the cleaning of the sensor. For any major works or re-calibrations the unit can be returned to SDi for repairs.

Sensor Care

The ultrasonic sensor is the most delicate part of a Portalevel® MINI®, and care must be taken when using it. The sensor is robust, but damage may occur if it is dropped, or if the sensor is dragged across the surface of the steel rather than being removed and replaced in steps. The rubber pad on the end of the sensor is designed to protect the face of the transducer inside, so care must be taken to avoid scratching or damaging this pad to allow the sensor to work efficiently.

After using a Portalevel® MINI®, it is essential that the end of the sensor is dried off, regardless if water or gel is used. If not dried after use, the magnet is likely to rust and the spring mechanism may jam if gel dries internally. If the spring mechanism does jam, it can be cleared by unscrewing the endcap of the sensor, removing the mechanism from inside, and carefully cleaning the transducer and sensor. When replacing the internal mechanism, the groove along the top of the transducer must be aligned with the groove on the inside of the sensor housing, otherwise it will not reassemble correctly.

Battery Care

The Portalevel® MINI® low battery icon which shows on the screen when the battery need replacing.

When the battery low icon is displayed, the battery must be replaced before the unit is used further.

Battery Replacement

You will need a Philips screwdriver and 4x AA 1.5V Batteries.

Step 1: Turn unit onto its front, gently slide off battery hatch.

Step 2: Replace batteries with 4x AA 1.5V batteries, taking care to match the correct orientation/polarities of the batteries into the slots.

Step 3: Place battery hatch back into housing and gently slide into place.

Step 5: If Steps 1-4 do not rectify the issue then please contact service@sdifire.com

Storage

When a Portalevel® MINI® unit is going to be stored, or not used for a long period of time, remove the battery from the main unit to prevent corrosion damage to the unit. This will also prolong battery life.

5. Training

This section is for new or untrained users, or for users who may need to remind themselves of how to operate a Portalevel® MINI®.

The positions of the particular controls for the Portalevel® MINI® are shown at the beginning of the manual in section 1.2, page 4, and the names and functions of Portalevel® MINI® accessories are shown in section 4, page 22.

The main purpose of this short guide is to explain the BENCH Test and also to direct users towards the resources in section 6, which includes further help and videos showing how to use the Portalevel® MINI® on different cylinders.

The BENCH Test:
The purpose of the BENCH Test it to familiarise users with the Portalevel® MINI® in a simple testing environment, before moving onto testing real cylinders which can be more challenging.

To perform the BENCH Test, you will need:

- The Portalevel® MINI® unit on which you are to be trained.
- The included ultrasonic gel or a container of water to use as couplant.
- A large container, half full of water, to simulate a pressurised cylinder
    - A metal (ideally magnetic) container works best, though a hard plastic container will still work. The shape of the container is not particularly important, as long as its outside surface is smooth enough for the sensor to be cleanly pressed against it, and it is tall enough for the sensor moved up and down in steps of a few centimetres.

The BENCH Test is very easy to perform. Simply follow the steps on the following pages, where you will use the Portalevel® MINI® to detect the water liquid level in your chosen large container, and in the process you will familiarise yourself with the basic procedure of using a Portalevel® MINI®.

The BENCH Test:

Step 1: Connect the extension rod to the Portalevel® MINI® unit and turn the unit on.

Step 2: Choose a vertical strip of your large container which is as continuously smooth as possible, free of chips, rust or any other kind of damage. Apply water or the ultrasonic gel along the length of this chosen vertical strip.

Step 3: With all Portalevel® MINI® testing, you must first find where on the cylinder you find, in general, the highest digital readings: above the liquid level or below the liquid level. To do this, place the sensor at the top of the chosen vertical strip (see note below), and take note of the reading the Portalevel® MINI® main unit displays. Then move the sensor down in a step roughly 5cm (2 inches), and make another note of the value the main unit reads. Once you have reached the bottom of the vertical strip, ask yourself: In general, where did I find the highest readings?

Note: The sensor must always be positioned with the 'TOP' marking positioned pointing exactly upwards. On some sensors the 'TOP' is marked by a simple dot. If the sensor is not accurately placed the right way up, then anomalous readings will be found.

Step 4: You should have found the highest readings when the sensor was placed on an area of the large container which was **below** the water liquid level. When testing real cylinders, this test must be performed for each new type of cylinders, and you may find the highest readings above or below the liquid level. However, when testing water you should always find the highest readings below liquid level.

Step 5: Place the sensor on an area of the large container which is below the liquid level (You should see high readings on the display). Now press the CAL button on the unit to *calibrate* it to this particular container. **You should now see a full bar graph on the display of the unit.** When testing on any container or cylinder, you always calibrate the Portalevel® MINI® on the side of the liquid level which gives you the highest readings.

Step 6: Move the sensor back up the vertical strip of the cylinder, again in steps of roughly 5cm (2 inches), observing the bar graph each time you place the sensor onto the container wall. Be sure the vertical strip of wall you chose of the container is still well covered by whatever couplant (water or gel) you have chosen.

Step 7: As you progress up the wall of the container, the numerical readout on the Portalevel® MINI® unit will change, and the bar graph might fluctuate slightly. However, the bar graph will only disappear entirely once you place the sensor on the container wall above the liquid level. Once you observe this, move the sensor back down the container in smaller steps, until the bar graph reappears. You have found the liquid level.

Note: For increased accuracy, it is possible to move the sensor in very small steps further up or down to find the position where the bar graph settles in the middle of its range (neither full or empty). At this point, the liquid level can be identified at the position of the exact middle of the sensor with an uncertainty of ±1.5mm.

PORTAGAUGE® 3

OPERATING INSTRUCTIONS

Operation: Plug the sensor into the Portagauge® 3, aligning the red marks. Turn it on by pressing the ON switch
Place a small amount of ultrasonic gel on to the sensor face Press the sensor face with medium pressure onto the 5mm calibration shim provided.
If the reading is not exactly 5.00mm calibrate as described below
If the reading is correct, proceed to test as normal, using a small amount of ultrasonic gel if required to ensure a good signal. The unit has a one minute power cut off to save battery power.

Calibration: Standard meters are calibrated to read thickness in mild steel. The meter will give readings on most other metals and on many non-metals. These readings can be converted to actual thickness by use of the appropriate conversion factor which is the ratio between the speed of sound in the material being tested and the speed of sound in mild steel. Conversion factors for various materials are available on request and a short list is included overleaf in this manual. Meters can be supplied calibrated for other materials.

Small adjustments of the calibration can be made as follows:

a. Place probe on the 5mm calibration shim provided and insert a small screwdriver into the small hole on the left hand side of the meter
b. Engage the slot in the preset control and rotate until the meter reads correctly. Avoid excessive pressure on screwdriver.

In the event of any query, contact SDi Fire service department,
Email: service@sdifire.com, telephone: (732)-751-9266, website: www.sdifire.com

Battery: Replacement necessary when “low bat” shows on display
Lever off both screw covers on bottom of unit, unscrew and replace with 9V battery

Testing Pipework: For best results keep central division of probe at 90 deg to axis of pipe

Service and Maintenance:

- Keep meter clean, do not allow it to become covered in oil or grease or to become wet.
- Avoid excessive rough handling.
- Should the meter malfunction, return to Coltraco Repair Dept. for servicing.
- The probe is the part most likely to suffer from wear and tear. It is recommended that a spare probe be kept in reserve, particularly if essential work is being done.

Warranty: The Portagauge 3 unit and sensor are covered by our no quibble 12 month warranty, provided that the electronic unit has not been opened, and that the items have been used in accordance with the instructions and not abused or tampered with.

CONVERSION FACTORS FOR OTHER MATERIALS:

Stainless Steel:	multiply reading by 0.96
Aluminium:	multiply reading by 1.1
Copper:	multiply reading by 0.80
Brass:	multiply reading by 0.73
Cast Iron:	Factor varies from 0.7 (coarse grain) To 0.9 (fine grain)
Perspex:	Multiply reading by 0.45

NB Factors given are averages – a cross check on an accurately known thickness is always advisable

In the event of any query, contact SDi Fire service department,
Email: service@sdifire.com, telephone: (732)-751-9266, website: www.sdifire.com

PORTAGAUGE® 4

USER MANUAL

ISO

IPC
ASSOCIATION CONNECTING
ELECTRONICS INDUSTRIES®

Pb
lead-free

Contents

1. Introduction and key features

What does the Portagauge® do?

The Portagauge® 4 is a portable, robust device used to accurately measure the thickness of a material using multiple echo, ultrasonic technology. The Portagauge® 4 is capable of working across a large number of different applications and environments, whether this be different surface conditions, the presence of rust, small curvature surfaces or for any other maintenance and inspection requirement. The unit operates on a wide range of metal materials (Steel/ Stainless Steel, Cast Iron, Aluminium, Copper, Brass, Zinc, Grey Cast Iron).

Due to its use of ultrasonic methods, the Portagauge® 4 only needs access to one side of a surface to measure the thickness of the material. This enables the device to non-invasively measure the wall thickness of metal pipes, tanks, beams and other such structures without any risk of damage.

The Portagauge® 4

The Portagauge® 4 is the most advanced and accurate model of the Portagauge® range. Its use of multiple echo ultrasonic technology allows it to account for coatings of up to 20 mm, ensuring that they are not included in the measurement of the thickness of the material. Its design and function has been built on earlier models to achieve this accuracy as well as its durability and consistency. The enclosure is rated to IP 65 providing a high level of protection in even hard industrial environments.

The Portagauge® 4

Display: Color LCD display for access to the Measuring screen and Menu screen.

Left Option Key: Selects the option at the bottom left of the LCD screen

ON/OFF Button Simple power ON/OFF button – powered by 3 x 1.5V AA batteries providing approximately 20 hours of battery life. Keep turned off when not in use to save battery life

Battery Compartment: The battery compartment is at the back of the unit. It must be opened by a flat head tool

Lemo Connector: Allows for secure fastening of the cable for the sensor probe.

Right Option Key: Selects the option at the bottom right of the LCD screen

Directional Pad: The directional pad allows the items on the menu and sub-menus to be navigated using the left, right, up and down keys and selected using the Enter/OK key at the centre

Menu Button: Accesses the menu for the unit (see page 5 for more information on menu items).

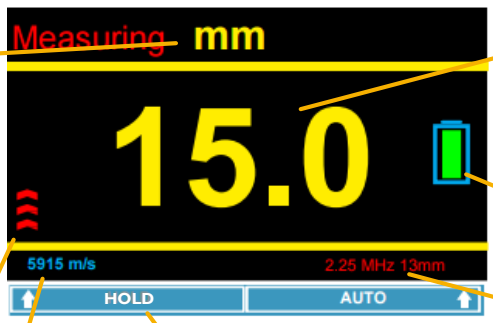
Sealing: Black rubber sealing for watertight integrity IP 65

Measuring Screen

Units of Measurements: The units of the measurements can be changed (inch/mm) by navigating to the "Units" section of the menu

Echo Strength: The greater the number of bars the greater the strength of the returning signal

Velocity of Ultrasound: Indicates the velocity of the ultrasound travelling through the material



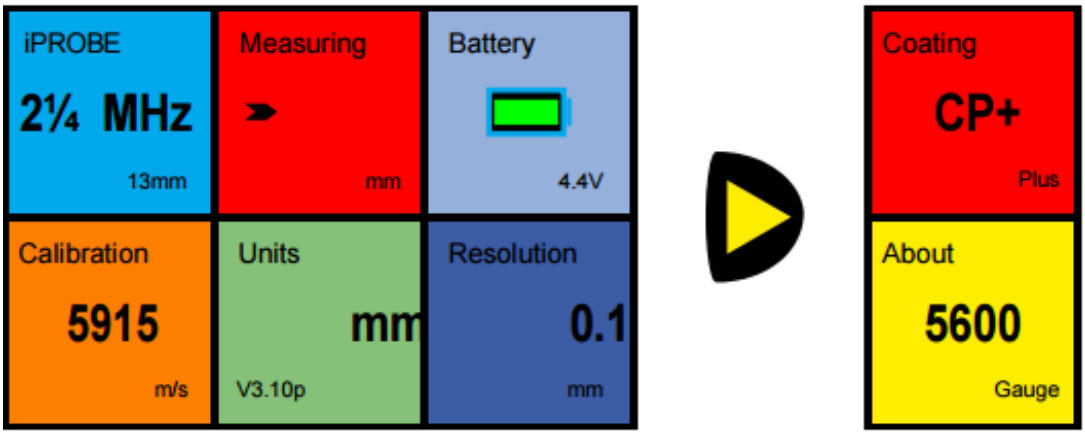
Digital Display: Numerical readings allow users to determine the thickness of the material

BAT OK: Checks battery level

iProbe indicator: Indicates the type of probe connected

Hold Measurement: Fixes the last thickness reading on the screen when the Left Option Key is pressed

Definition of Menu Items



iProbe — Shows that an iProbe has been connected. The probes are automatically recognised by the gauge and all the relevant probe data is transferred to the gauge to perfectly match the probe to the gauge for optimum performance.

Calibration — All materials have varying velocity of sound properties and this section allows the gauge to be calibrated for the different materials that the gauge can measure.

Measuring — Displays the measurements being taken by the gauge.

Units — The measurements can be displayed in metric or imperial.

Battery — Displays the remaining battery life. The green changes to yellow when the battery is getting low and then changes to red when the batteries are critically low.

Resolution — The measurements can be displayed to a resolution of 0.05mm or 0.1mm.

Coating Plus+ — Allows measurements to be taken through extremely thick coatings up to 20mm, depending on the type of coating. In normal mode the gauge can still ignore up to 6mm of coating.

About 5600 — Displays the software and firmware versions and includes a facility to reset the gauge to factory settings.

Note:The "Coating Plus" and "About 5600" menus items may be found by pressing the right key on the directional pad.

How does a Portagauge® 4 work?

All sound is physical vibrations which move through a material, and in the case of the sound we are used to, the vibrations move through air. Ultrasound is the same as the sound we experience, but its frequency is beyond that which humans are capable of hearing. Whilst the highest frequency a human can hear is around 20,000 Hz, Portagauge® 4 units use sound at a frequency of 2.5 MHz, 3.5 MHz or 5 MHz depending on the specific probe being used.

All Portagauge® devices use ultrasound to measure the thickness of a material. The unit sends a strong electrical signal to the probe, causing it to emit a high energy pulse of ultrasound. The transmitted ultrasound pulse travels though both the coating and the metal and reflects from the back wall. The returned echo then reverberates within the metal, with only a small portion of the echo travelling back through the coating each time (Figure 1). The timing between the small echoes gives the timing of the echoes within the metal, which relate to the metal thickness. The returned echoes need not be consecutive as the gauge will interpret them automatically and calculate the thickness. A minimum of three echoes are checked for each pulse that is sent into the metal.

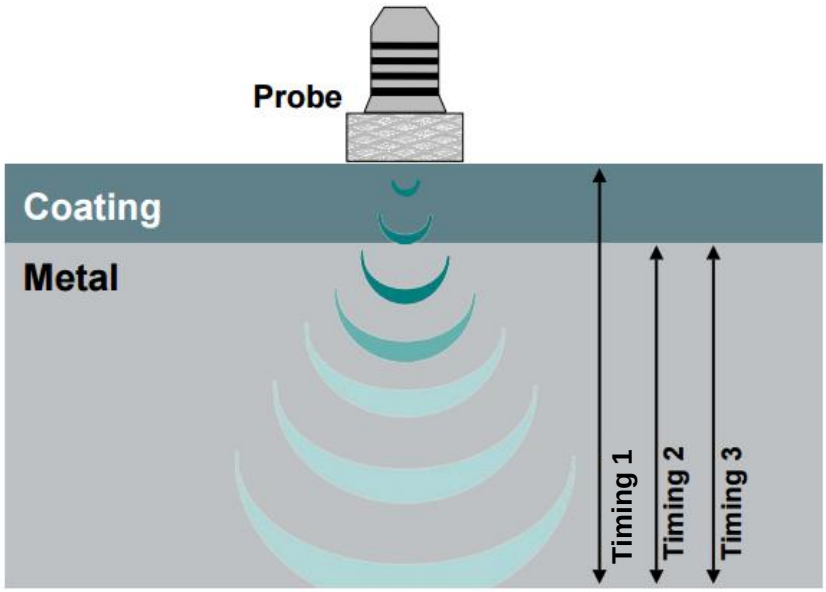


Figure 1

2. Operating Instructions

DO NOT PROCEED BEFORE READING SECTION 1.

There are two basic procedures which must be carried out when using the Portagauge® 4:

1. Preparation: Calibration ensures that the Portagauge® equipment functions properly for the specific metal being tested.

2. Testing: After step one, you can follow the appropriate testing procedure.

1. PREPARATION

Preparation for testing is simple, quick and ensures you get the most reliable and accurate results from your testing. It ensures the equipment is assembled correctly and that the appropriate probe is selected. Calibration ensures that the unit and probe work correctly for the specific metal being tested.

Assembly

To assemble the gauge for use:

STEP 1: Attach the probe to the probe cable by pushing the cable Lemo plug into the socket on the probe.

STEP 2: Connect the other end to the gauge Lemo socket (see page 4).

To remove the connectors, simply pull back on the connector collars to release the plug from the socket. Do not force or twist under any circumstances.

Probes

The probes used with the Portagauge® 4 thickness gauges are single crystal soft faced probes. The table below identifies the different probe options and which probe is the most suitable for different applications. All probes are color coded to help identify their frequency.

Frequency	2.25 MHz	3.5 MHz	5 MHz
Measuring Range	3 – 250 mm (0.120" to 10")	2 – 150 mm (0.080" to 6")	1 – 50 mm (0.040" to 2")
Color	Yellow	Green	Blue
Diameters Available	13 mm (0.5") & 19 mm (0.75")	13 mm (0.5")	6 mm (0.25") & 13 mm (0.5")
Suitable For	Most thickness gauging applications. Works particularly well on heavy corrosion, especially the 19 mm probe.	Will measure relatively thin metal which is corroded. Normally used only if measuring down to 2 mm is of importance.	Ideal for measuring thin metal in relatively good condition. Not advisable to use as main probe.

Note: The details of the probe connected are recognized and displayed on the Measuring Screen, as seen on page 4, or under the iProbe item on the Menu, as seen on page 5.

Probe Membranes
All probes are fitted with protective membranes to help prolong the life of the probe. The membranes also provide a flexible interface which acts as an aid when working on rough surfaces. Membrane wear should be monitored and checked at regular intervals.

Normal Temperature Membranes
Standard membranes allow measurements to be taken on hot surfaces up to a maximum of 158°F (70°C).

High Temperature Membranes
Teflon™ membranes are available for measurements on hotter surfaces. In this case measurements can be taken on surfaces up to 302°F (150°C). Care should be taken that the probe does not overheat. The probe should be allowed to cool down in between each measurement. A high temperature ultrasonic gel is advised for this application.

Note: All probes should be treated with care. When taking measurements, they should not be scraped or dragged along the surface. Although the membranes will protect the probe against everyday wear and tear, they will not protect against rough treatment and misuse.

Calibration

The gauge should be calibrated to the type of material that is being measured. This is because ultrasound travels at different speeds in different materials.

There are two methods of changing the calibration. Either adjust the velocity of sound setting according to the metal being measured, or adjust the gauge to a known thickness of metal.

Gauges are supplied with the calibration set to mild steel at approximately 5900 m/s. This may vary according to the properties of the supplied 15 mm test block material.

Calibrating to the Velocity of the Ultrasound

STEP 1: Navigate to 'Calibration' on the 'Menu' screen using the keys on the directional pad (see page 4). Use the *Definition of Menu Items* on page 5 as a guide.

STEP 2: Press the 'OK' button at the centre of the directional pad.

STEP 3: Use the left and right buttons on the directional pad to adjust the velocity of sound to the required new velocity that the ultrasound travels at in the material being tested. Approximate values for these may be found on page 11.

STEP 4: Press the 'Right Option Key', the gauge will save the new calibration and return to the 'Menu' screen.

Calibrating to a Known Thickness

STEP 1: Navigate to 'Calibration' on the 'Menu' screen using the keys on the directional pad. Use the *Definition of Menu Items* on page 5 as a guide.

STEP 2: Press the 'OK' button at the centre of the directional pad.

STEP 3: Place the probe on a piece of material of known thickness such as the 15mm test block supplied with the kit.

STEP 4: Adjust the measurement displayed to the known thickness using the left and right buttons on the directional pad.

STEP 5: Press the 'Right Option Key', the gauge will save the new calibration and return to the 'Menu' screen.

Note: The calibration does not need to be reset each time the gauge is used. The last setting will be remembered.

Speed Table

The given values are in certain cases strongly dependent on the alloy, heat treatment, manufacturing and processing and are therefore only approximate standard values. They are given here as a guide only.

Material	Speed – m/s
Aluminium Rolled Duraluminium	6200 – 6360 6420 6320
Bronze (5%P)	3531
Copper	3666 – 4760
Glass, Plate	5766
Inconel, Forged	7820
Lead	2050 – 2400
Steel, Mild Supplied Test Block	5890 – 5960 5900 approx.
Steel, Stainless 10 Cr Ni 18 8, ann	5530 – 5790 5530
Steel, Tool C105 Annealed C105 Hardened	 5490 – 5960 5854
Tin	3210 – 3320
Titanium	5823 – 6260
Zinc	3890 - 4210

Reference: Mathies, Klaus (1998), Thickness Measurement with Ultrasound, Berlin: German Society of Nondestructive Testing.

2. TESTING with the Portagauge® 4

PRECAUTIONS:

Check that the material has parallel front and back walls. If the front and back walls are not parallel, the ultrasound hitting the back wall will be deflected away from the face of the probe. The probe will therefore not receive any echoes back.

The surface being measured should be free from dirt or debris. It may be necessary to clean or brush the surface prior to taking measurements.

Ensure the coating is not layered or does not contain foreign objects in its construction. Layered coatings cause reflections at the layer interface. This seriously weakens the strength of the ultrasound and may prevent it from travelling all the way through. The same applies to foreign objects which can deflect the ultrasound path or prevent the ultrasound from passing.

Ensure the coating is solidly adhered to the surface. Triple echo will ignore coatings as long as they are solidly adhered to the surface. If the coating has become loose or delaminated then air pockets will exist which interfere with the Ultrasound.

PROCEDURE:

STEP 1: Unscrew the probe knurled ring and apply a few drops of membrane oil to the face of the probe. Do not apply too much membrane oil underneath the membrane. Once fitted, the membrane should be flat with no air bubbles trapped behind.

STEP 2: Re-screw the knurled ring, ensuring there are no air pockets.

STEP 3: Connect the probe, cable and gauge together (see page 8).

STEP 4: Turn on the gauge using the ON/OFF button (see page 4).

Note: If a compatible probe other than an SDi probe is attached to the unit, the gauge will automatically detect this and display the message "Unrecognised Probe". If this occurs press the "OK" button and then select the correct parameters (frequency and diameter) for the probe being used.

STEP 5: The normal measurement mode will ignore coatings of up to approximately 6 mm. If a coating between 6 mm to 20 mm exists then the Coating Plus+ mode, accessed by navigating to the right of the Menu screen (see page 5) using the arrow keys on the directional pad and selecting the feature using the 'OK' button, can be turned on to measure the metal thickness in such cases.

Note: If the message "No Probe connected" appears, either connect a suitable probe or simply press the "OK" button to enable the navigation of the menus without a probe fitted. No measurements can be taken if a probe is not detected.

The Coating Plus+ feature is automatically switched off when the unit is turned off. If this feature is required permanently, press the 'Right Option Key' labelled "SAVE" to keep this as a permanent setting. The CP+ icon will be displayed on the right of the Measuring screen if the feature is selected.

Note: The Coating Plus+ mode should not be left on for all measurements. The gauge will achieve a better performance on standard coatings with this function turned off.

STEP 6: Navigate using the arrow keys on the directional pad to the 'Measuring' item on the Menu screen. Press the 'OK' button to access the Measuring screen.

STEP 7: Apply a small amount of gel to the surface being measured to eliminate the possibility of air pockets between the surface and the probe.

STEP 8: Apply the probe firmly to the surface, ensuring good contact, and take the measurement. It may sometimes be necessary to rock the probe slightly and gently in order to obtain measurements (only do so if you are having trouble obtaining measurements).

STEP 9: If you wish to hold a measurement, press the 'Left Option Key' whilst readings are being taken. The display will hold the measurement and flash 'Holding' in the top right corner of the LCD screen. Measuring may be resumed by pressing the 'Left Option Key' again which is now labelled "Resume".

STEP 10: Remove debris from the probe face between measurements.

Note: The units and resolution of measurements can be changed using the respective options on the Menu screen (see page 5).

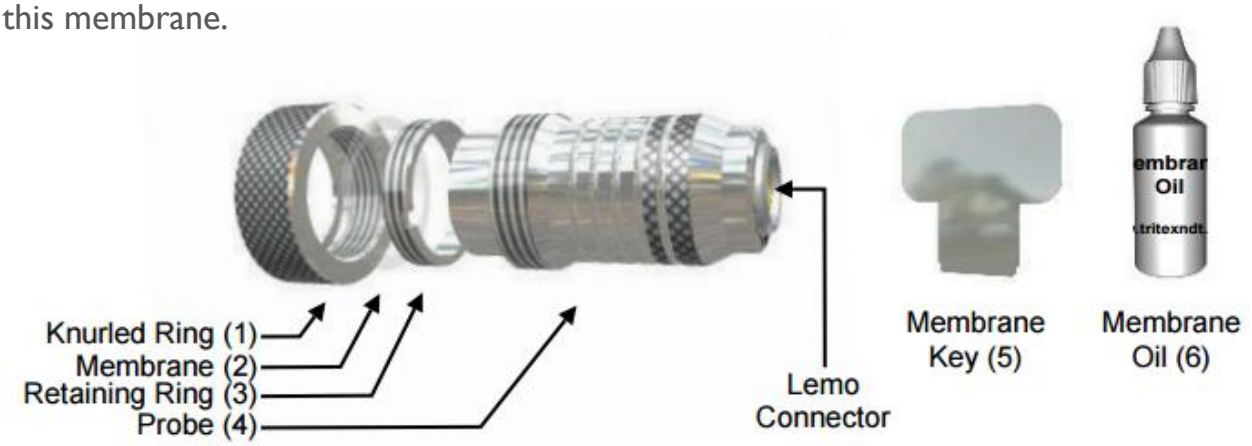
3. Maintenance

This section contains instructions on how to maintain the equipment to extend its lifetime as long as possible. Maintenance of the equipment is simple and only requires the cleaning of the probe and battery care. For any major works or re-calibrations the unit can may need to be sent to the manufacturer for repair.

Probe Care

The ultrasonic probe is the most delicate part of a Portagauge®, and care must be taken when using it. After using a Portagauge®, it is essential to ensure that the probe is dried off and free from dirt. The probe is robust, but damage may occur if it is dropped, or if the probe is dragged across the surface rather than being removed and replaced. Never try to repair a probe or try to remove scratches from the face of the probe. This may result in further damage. Always return it to SDi for investigation and possible repair.

The membrane requires changing from time to time to ensure the protection of the probe and the prolonging of its lifetime. See below for instructions on how to change this membrane.



STEP 1: Unscrew the knurled ring (1) from the probe (4).

STEP 2: Using the membrane key (5), remove the retaining ring (3) from inside the knurled ring (1).

STEP 3: Push the old membrane (2) out from the front.

STEP 4: Fit a new membrane (2) from the back and push it down until it locates in the groove on the inside front edge.

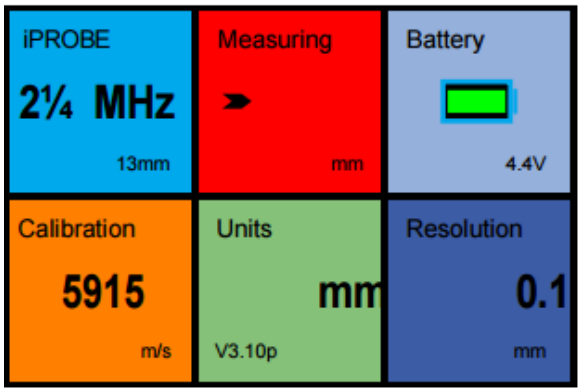
STEP 5: Refit the retaining ring (3) and secure it in place using the membrane key (5).

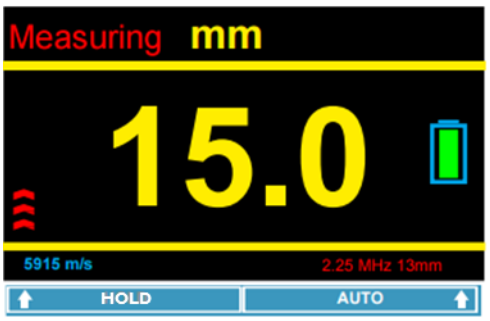
STEP 6: Place a few drops of membrane oil (6) onto the face of the probe (4). Do not use too much.

STEP 7: Screw the knurled ring (1) back onto the probe (4) whilst applying pressure on the membrane (2) with the thumb to expel any air from behind the membrane.

Battery Care

The Portagauger® 4 has a battery indicator on the right of the 'Measuring' screen and on the top right of the 'Menu' screen.





When the battery is indicated to be low on power, the battery must be replaced before it is used further, or the unit may provide anomalous results.

When a Portagauge® unit is going to be stored, or not used for a long period of time, remove the battery from the main unit to prevent corrosion damage to the unit.

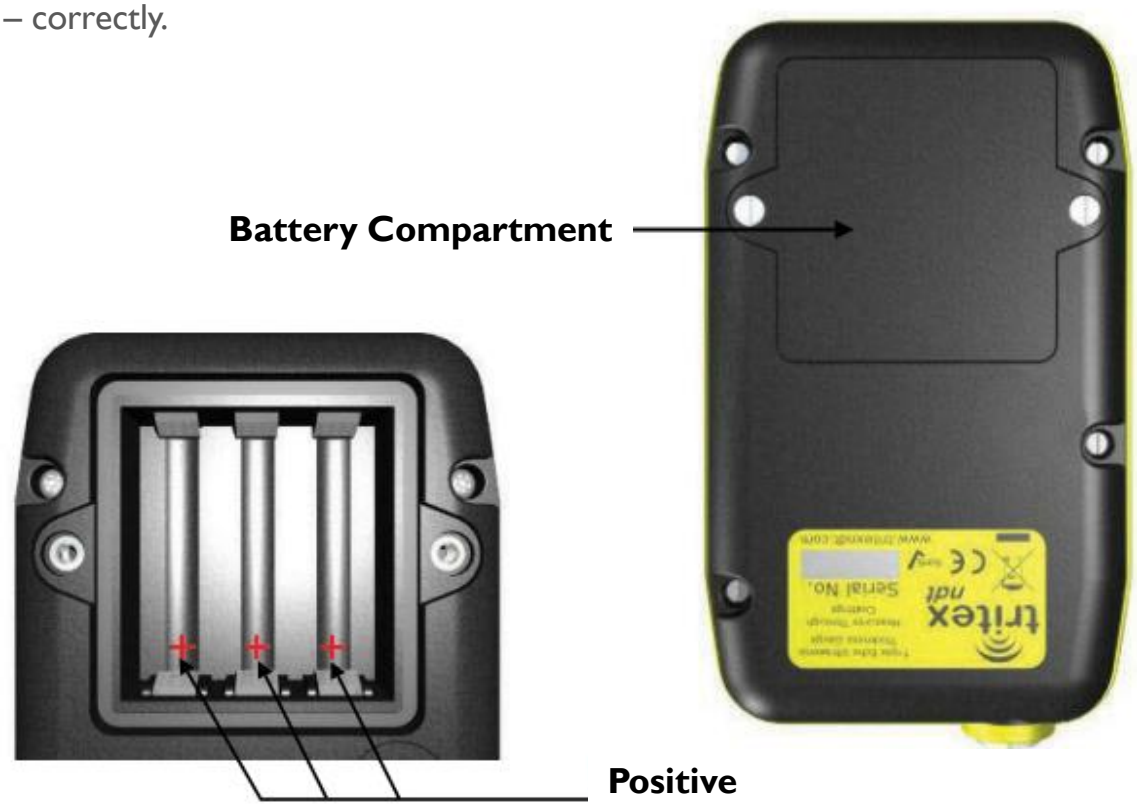
Battery Replacement
You will need a small flathead screwdriver and three 1.5V AA batteries.

STEP 1: Ensure the unit is off and turn the unit so that the front fascia faces downwards.

STEP 2: Take a small, flat head screwdriver and unscrew the two screws holding down the hatch of the battery compartment.

STEP 3: Lever the screwdriver gently to remove the hatch.

STEP 4: Remove the old batteries and replace with the new, taking care to connect + and – correctly.



STEP 6: Close battery cover, ensuring that the wires are not trapped.

STEP 7: Press battery hatch and use the screwdriver to replace the screws so that the hatch of the battery compartment is closed once again..

PORTASTEELE®

USER MANUAL

Contents

1. Introduction and key features

What does the Portasteele® do?

The Portasteele® is an application which is readily installed on a rugged, secure tablet. The Portasteele® uses information input by the user, including the dimensions of a cylinder and its liquid level, to calculate the mass of agent contained within a cylinder. It can also be used in reverse to calculate a theoretical liquid level for a cylinder, given a value of agent weight. The Portasteele® can be used for CO_2, FM-200 and NOVEC 1230. The Portasteele provides a quick, effective alternative to manually weighing cylinders. It is easy and intuitive to use, allowing users to test cylinders reliably and efficiently.

Portasteele®

The Portasteele® is the first application of its kind. It is a true replacement for the time-consuming and potentially hazardous process of manually weighing cylinders. The application is installed on a rugged, portable tablet, meaning it can be used in a almost any environment. It is quick to use, with the user being able to store the dimensions of cylinders on the tablets to be used in the future. It has a friendly user interface, making it accessible to any member of a team or crew.

Portasteele®

Micro USB port: USB cable may be connected to charge the device or to connect to a PC to export data from the Portasteele® application.

Power Button: Powers the device on and off when held down.

Ruggedized Casing: Casing designed to be hard-wearing and shock resistant with a rating of IP 68.

Touch Screen: Capacitive touch screen for easy navigation through and interaction with the Portasteele® application.

How does the Portasteele® work?

The Portasteele uses measurements of the dimensions of a cylinder, such as height and circumference, to calculate the volume of the space inside a cylinder. From there it can use the value of the liquid level, also measured by the user, to find out how much of this volume is occupied by the agent inside the cylinder. This information is then used to calculate the mass of the agent inside the cylinder.

2. Preparation

Before using the Portasteele® it is important to ensure that the tablet is set up correctly.

I. Tablet Setup

The tablet should be fully charged on receipt. A charger will accompany the tablet on arrival. The tablet can be charged via PC or electrical outlet and the charger is plugged into the micro-USB socket as shown on page 4.

Once fully charged, the tablet can be switched on using the power button situated on top of the tablet, as shown on page 4.

Once switched on, several basic settings may be altered at the user's discretion such as the time and date and brightness. Only basic settings are accessible in order to avoid compromising the primary function of the tablet.

In order to use certain features of the Portasteele® application, you should also set up an email account for use on the tablet. This can be done during initial preparation, or alternatively the application will prompt you to do so when necessary.

2 Testing

After the initial setup of the tablet, it should be tested to ensure that the Portasteele® tablet is functioning properly and that calculation results are correct. Begin by launching the Portasteele® application, which is shown by its icon on the home screen of the tablet.

Below are some test parameters which will allow the application to be tested, to ensure the inputs are being entered correctly.
Start Calculator Mode by following the instructions on page 8.
When Calculator Mode launches its default mode should be to calculate the mass of a CO_2 cylinder using metric units. If these settings are not correct then alter them, following the instructions on page 9.
To enter measurements, tap in the space above the line next to the corresponding measurement value to be entered, as explained on page 25.
Then use the on screen key pad to enter the correct values, as shown below.

Height	Circumference	Liquid Level	Temperature	Dome Height	Thickness
134	85	103.6	20.2	11	6.6

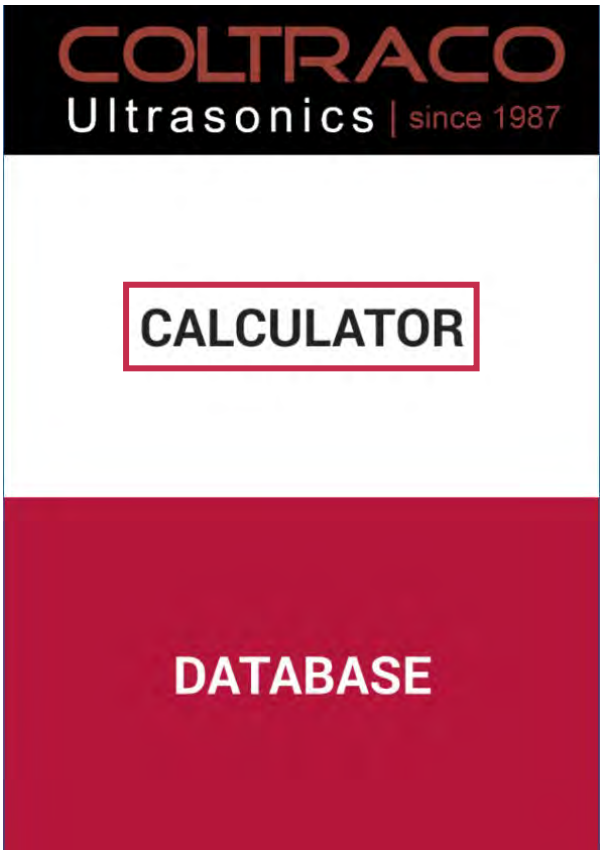
Once all the measurements have been correctly inputted into the calculator, close the keyboard and tap the 'Calculate' below the input boxes, as explained on page 26.

This should calculate the Actual Agent Mass as 45.00. If this is the case then your tablet is functioning correctly and preparation is complete. If this is not the case, please check your inputs again and retry the calculation. If your tablet continues to produce an incorrect result, please get in touch with our technical team, who will be happy to help.

3. Calculator Mode

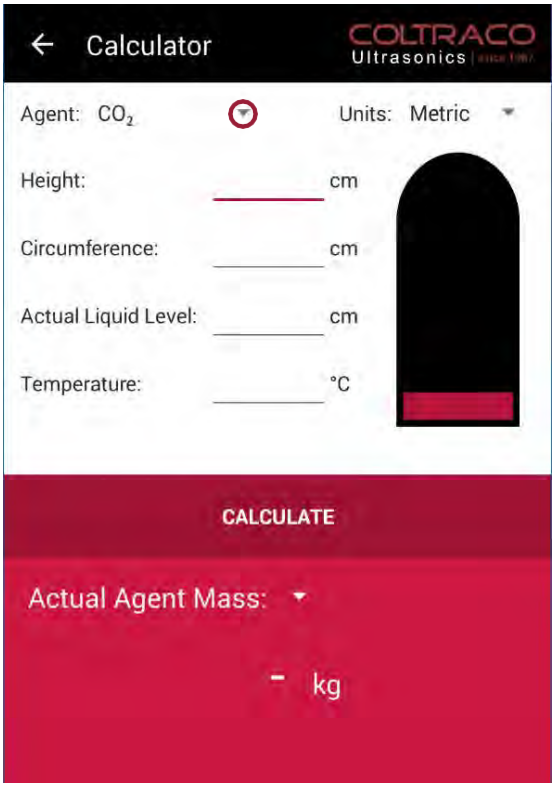
Calculator Mode is used to quickly input measurements for a single cylinder, and receive the calculated result for either Actual Agent Mass or Expected Liquid Level, depending on what has been input.

When the application boots it will open onto its home screen.

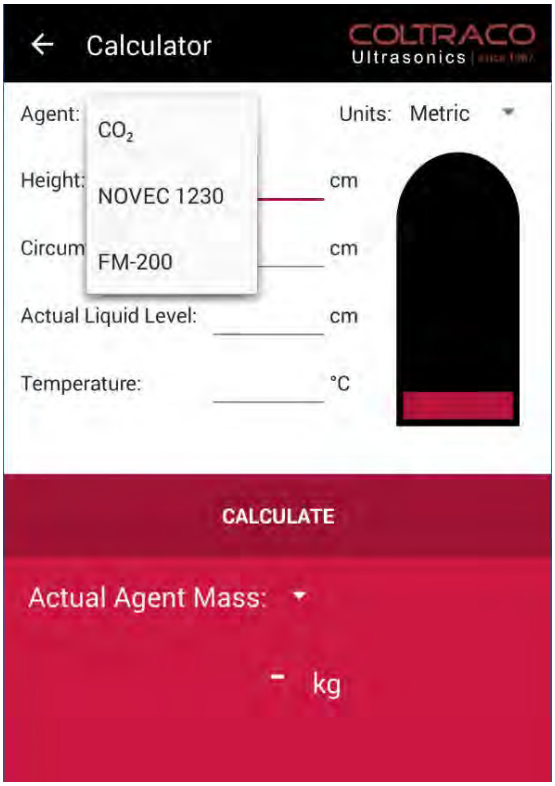


To begin carrying out calculations, select the Calculator option by tapping on the upper half of the screen as highlighted here.

Selecting the Calculator button will open up Calculator mode.

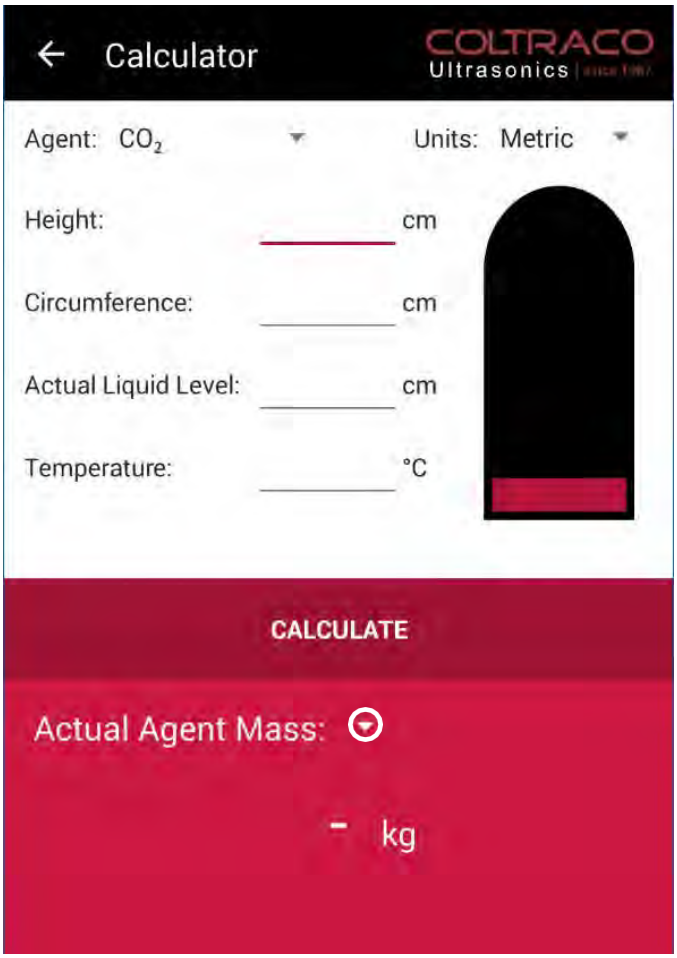


Start by using the drop down menus to select the agent type. To do this, tap on the drop down arrow next to agent, which can be seen here



Then select the desired agent from the drop down menu by tapping on the correct option.

Follow the same procedure to select the desired unit type (metric or imperial).



There is a similar drop down menu which can be used to change between calculating Actual Agent Mass and calculating Expected Liquid Level, as shown here.

Once these options have been selected, the measurements for the cylinder need to be entered into the calculator.

Part 1 – Calculating Mass Measurements

To calculate mass, the calculate type must be set to Actual Agent Mass – ensure this is correct before proceeding.

The measurements which need to be inputted into the calculator are slightly different depending on the agent in question. Please ensure you refer to the correct section for the cylinder you are measuring.

Accurate measurements are key to achieving accurate results; where possible follow the recommendations of accuracy given.

CO_2

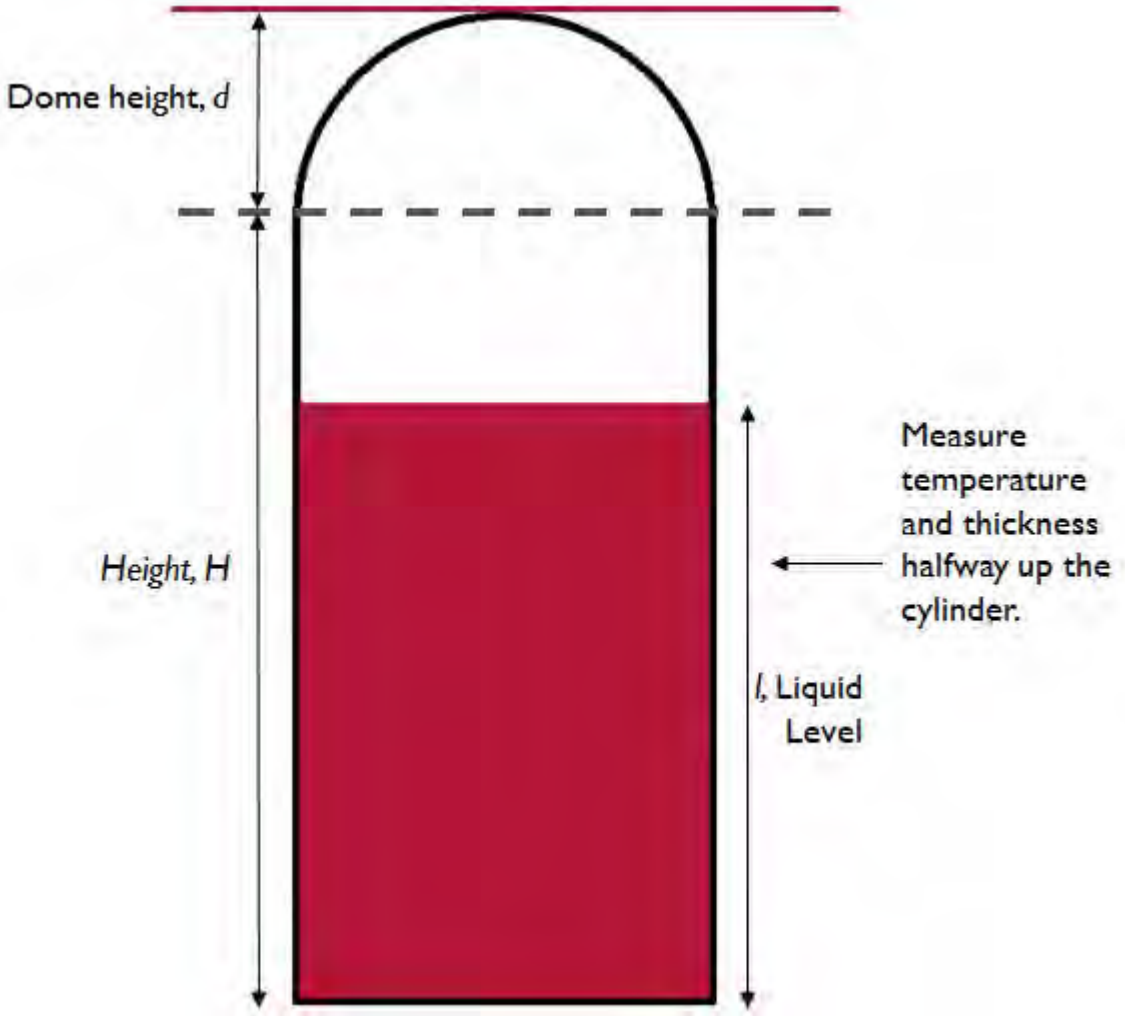
The measurements which need to be taken are:

- Height, this needs to be measured from the base of the cylinder to the point at which the cylinder begins to curve, shown as *H* in the diagram overleaf. This must be measured in centimetres for metric units and inches for imperial units. This needs to be measured to the nearest 0.1 cm or nearest 0.1 ".
- Circumference, this is the distance around the cylinder, and should be measured roughly half way up the cylinder, using a flexible measuring tape. This must be measured in centimetres for metric units and inches for imperial units. This needs to be measured to the nearest 0.1 cm or nearest 0.1 ".
- Liquid Level, this should be found using a Portalevel® unit, ensuring that you follow all the appropriate preparations and instructions in the corresponding Portalevel® manual. Once found, the liquid level should be measured from the base of the cylinder to the height located using the Portalevel®, shown as *l* in the diagram overleaf. This must be measured in centimetres for metric units and inches for imperial units. This needs to be measured to the nearest 0.1 cm or nearest 0.1 ".
- Temperature, this should be measured using a Portatherm® temperature probe, or other appropriate method. It should measured around half way up the cylinder and the full readout on the Portatherm® should be entered into the calculator. This must be measured in °C for metric units and °F for imperial units. If not using the Portatherm®, this needs to be measured to the nearest 0.1 °C or nearest 0.1 °F.
- Dome Height, this is the *vertical* height of the domed section at the top of the cylinder, shown as *d* in the diagram overleaf. This should be measured with the ruler or tape held at close to vertical as possible, and not following the curvature of the dome. This is shown as *d* in the diagram below. This must be measured in centimetres for metric units and inches for imperial units. This needs to be measured to the nearest 0.1 cm or nearest 0.1 ".
- Thickness, this is the thickness of the cylinder. It should be measured around half-way up the cylinder using a Portagauge® or other thickness measuring device. The full readout on the Portagauge® should be input into the calculator. This must be measured in millimetres for metric units and inches for imperial units. If not using the Portagauge®, this needs to be measured to the nearest 0.1 mm or nearest 0.1 ".

CO_2 Cylinder

The grey dashed line shows the point at which the cylinder *begins* to curve, it is important that measurements are correctly taken relative to this point.

The red line shows the top of the cylinder, the dome height should not include any components of the valves or tubing at the top of the cylinder.



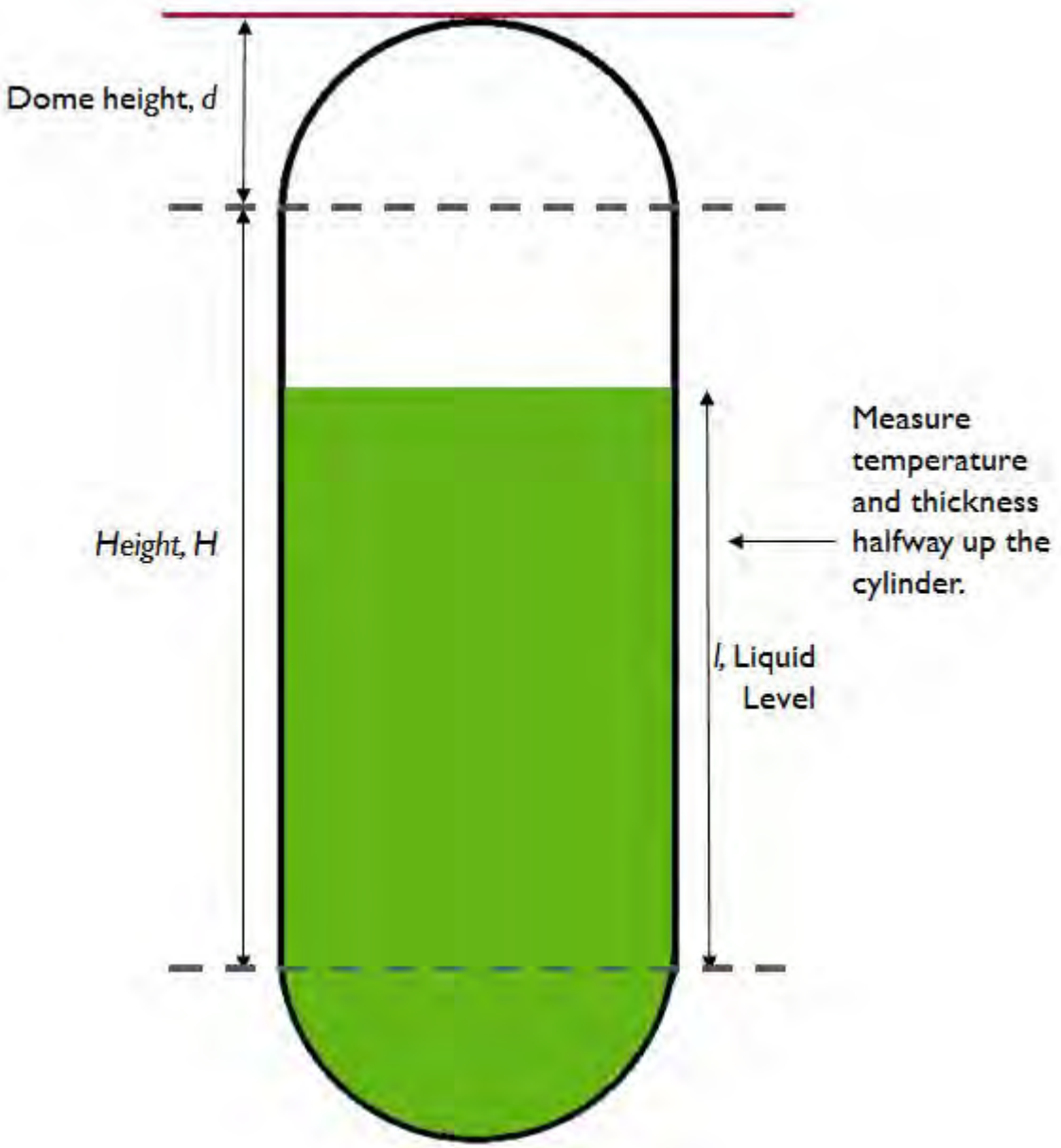
NOVEC 1230

The measurements which need to be taken are:

- Fill Weight, this is the mass of agent with which the cylinder was originally filled, and should be printed on the side of the cylinder. This must be measured in kilogrammes for metric units and pounds for imperial units. This needs to be measured to the nearest 0.1 kg or nearest 1 lb.
- Height, this needs to be measured from the base of the cylinder to the point at which the cylinder begins to curve, shown as *H* in the diagram overleaf. This must be measured in centimetres for metric units and inches for imperial units. This needs to be measured to the nearest 0.1 cm or nearest 0.1 ".
- Circumference, this is the distance around the cylinder, and should be measured roughly half way up the cylinder, using a flexible measuring tape. This must be measured in centimetres for metric units and inches for imperial units. This needs to be measured to the nearest 0.1 cm or nearest 0.1 ".
- Liquid Level, this should be found using a Portalevel® unit, ensuring that you follow all the appropriate preparations and instructions in the corresponding Portalevel® manual. Once found, the liquid level should be measured from the base of the cylinder to the height located using the Portalevel®, shown as *l* in the diagram overleaf. This must be measured in centimetres for metric units and inches for imperial units. This needs to be measured to the nearest 0.1 cm or nearest 0.1 ".
- Temperature, this should be measured using a Portatherm® temperature probe, or other appropriate method. It should measured around half way up the cylinder and the full readout on the Portatherm® should be entered into the calculator. This must be measured in °C for metric units and °F for imperial units. If not using the Portatherm®, this needs to be measured to the nearest 0.1 °C or nearest 0.1 °F.
- Dome Height, this is the *vertical* height of the domed section at the top of the cylinder, shown as *d* in the diagram overleaf. This should be measured with the ruler or tape held at close to vertical as possible, and not following the curvature of the dome. This is shown as *d* in the diagram below. This must be measured in centimetres for metric units and inches for imperial units. This needs to be measured to the nearest 0.1 cm or nearest 0.1 ".

NOVEC 1230 Cylinder

The grey dashed lines shows the points at which the cylinder *begins* to curve, it is important that measurements are taken correctly relative to these points.
The red line shows the top of the cylinder, the dome height should not include any components of the valves or tubing at the top of the cylinder.



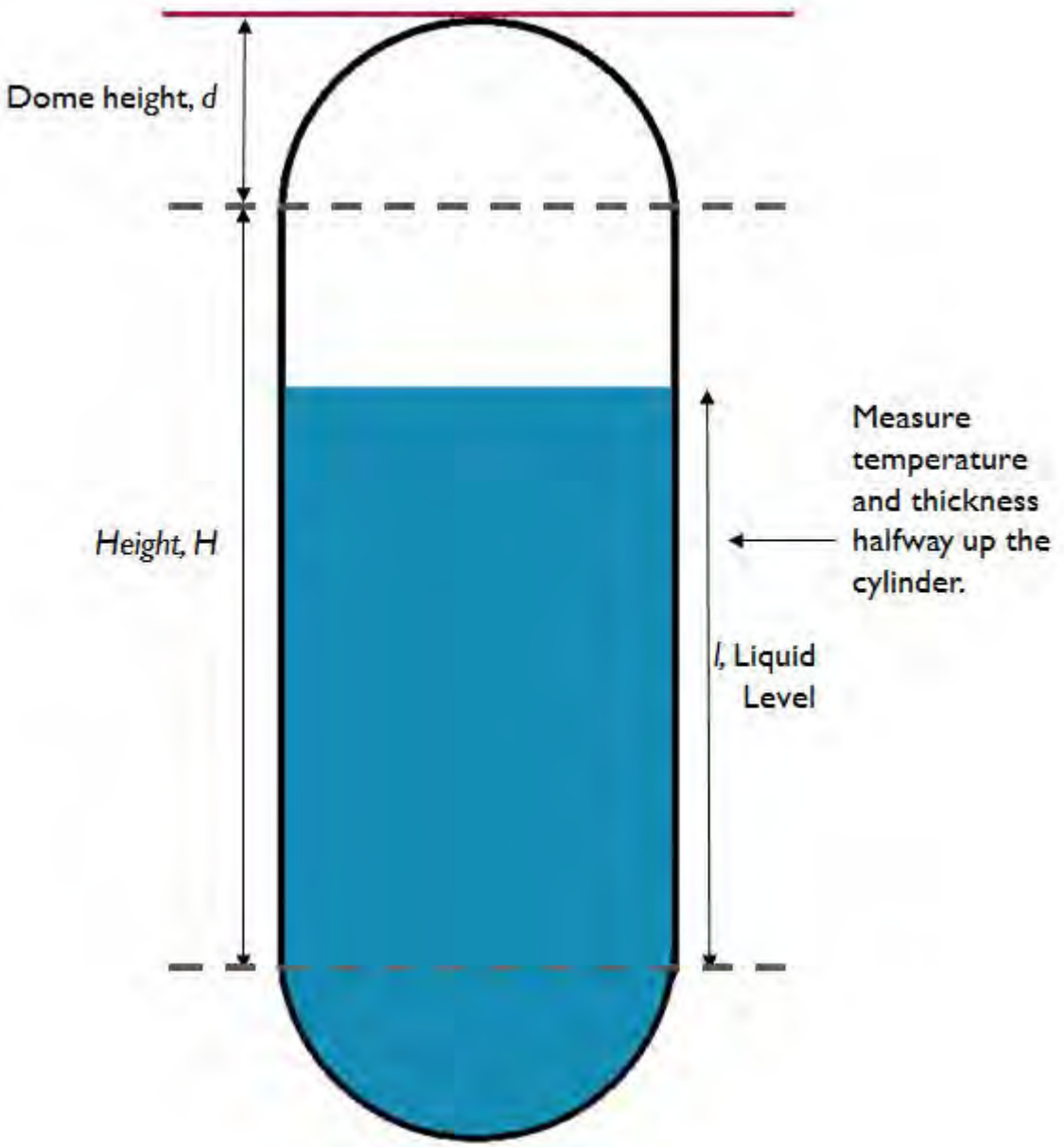
FM-200

The measurements which need to be taken are:

- Height, this needs to be measured from the base of the cylinder to the point at which the cylinder begins to curve, shown as *H* in the diagram overleaf. This must be measured in centimetres for metric units and inches for imperial units. This needs to be measured to the nearest 0.1 cm or nearest 0.1 ".
- Circumference, this is the distance around the cylinder, and should be measured roughly half way up the cylinder, using a flexible measuring tape. This must be measured in centimetres for metric units and inches for imperial units. This needs to be measured to the nearest 0.1 cm or nearest 0.1 ".
- Liquid Level, this should be found using a Portalevel® unit, ensuring that you follow all the appropriate preparations and instructions in the corresponding Portalevel® manual. Once found, the liquid level should be measured from the base of the cylinder to the height located using the Portalevel®, shown as *l* in the diagram overleaf. This must be measured in centimetres for metric units and inches for imperial units. This needs to be measured to the nearest 0.1 cm or nearest 0.1 ".
- Temperature, this should be measured using a Portatherm® temperature probe, or other appropriate method. It should measured around half way up the cylinder and the full readout on the Portatherm® should be entered into the calculator. This must be measured in °C for metric units and °F for imperial units. If not using the Portatherm®, this needs to be measured to the nearest 0.1 °C or nearest 0.1 °F.
- Dome Height, this is the *vertical* height of the domed section at the top of the cylinder, shown as *d* in the diagram overleaf. This should be measured with the ruler or tape held at close to vertical as possible, and not following the curvature of the dome. This is shown as *d* in the diagram below. This must be measured in centimetres for metric units and inches for imperial units. This needs to be measured to the nearest 0.1 cm or nearest 0.1 ".
- Thickness, this is the thickness of the cylinder. It should be measured around half-way up the cylinder using a Portagauge® or other thickness measuring device. The full readout on the Portagauge® should be input into the calculator. This must be measured in millimetres for metric units and inches for imperial units. If not using the Portagauge®, this needs to be measured to the nearest 0.1 mm or nearest 0.1 ".

FM-200 Cylinder

The grey dashed lines shows the points at which the cylinder *begins* to curve, it is important that measurements are taken correctly relative to these points.
The red line shows the top of the cylinder, the dome height should not include any components of the valves or tubing at the top of the cylinder.



Part 2 – Calculating Liquid Level Measurements

To calculate liquid level, the calculate type must be set to Expected Liquid Level – ensure this is correct before proceeding.

The measurements which need to be inputted into the calculator are slightly different depending on the agent in question. Please ensure you refer to the correct section for the cylinder you are measuring.

Accurate measurements are key to achieving an accurate results, where possible follow the recommendations of accuracy given.

CO_2

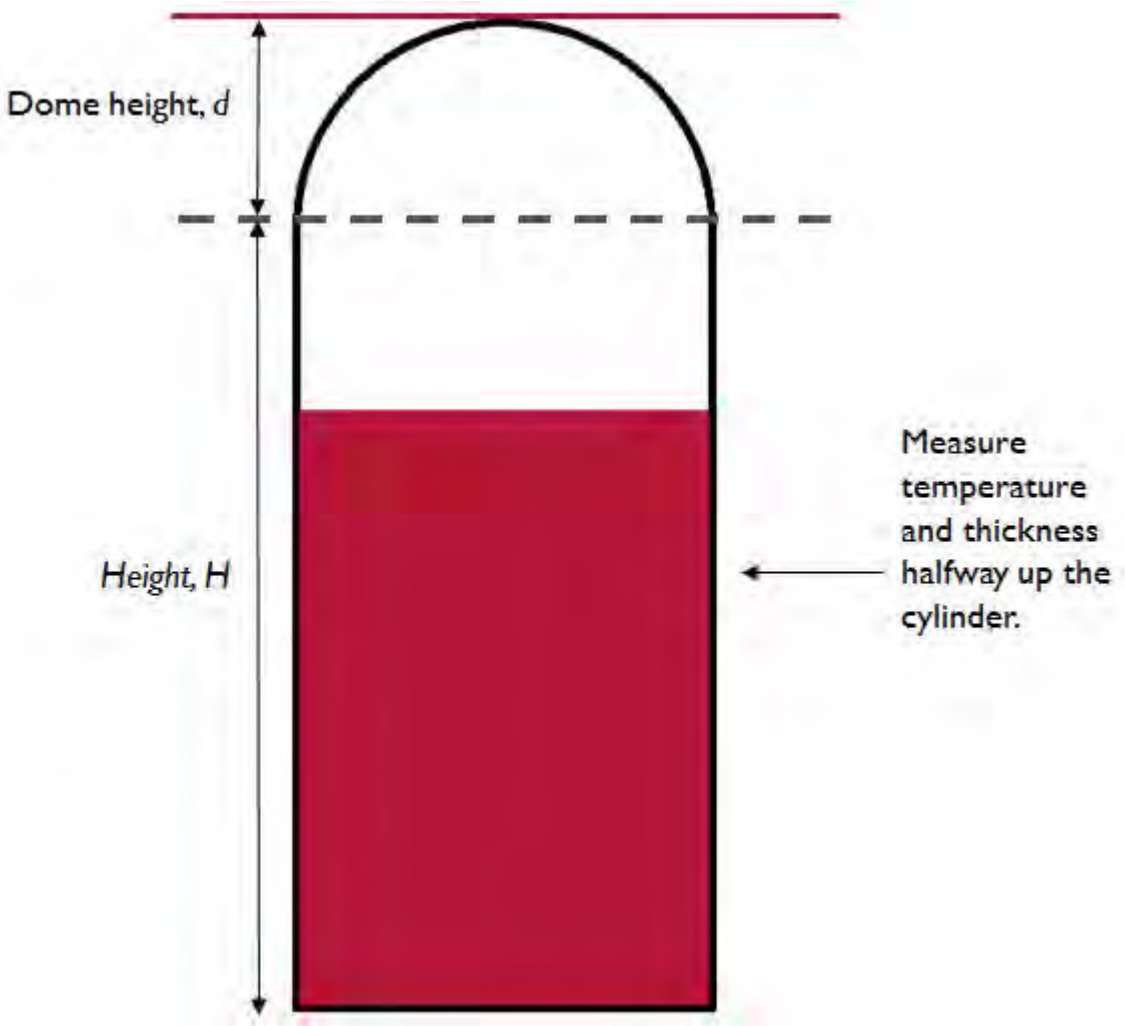
The measurements which need to be taken are:

- Actual Agent Mass, this is the mass of agent with which the cylinder was originally filled, and should be printed on the side of the cylinder. This must be measured in kilogrammes for metric units and pounds for imperial units. This needs to be measured to the nearest 0.1 kg or nearest 1 lb.
- Height, this needs to be measured from the base of the cylinder to the point at which the cylinder begins to curve, shown as *H* in the diagram overleaf. This must be measured in centimetres for metric units and inches for imperial units. This needs to be measured to the nearest 0.1 cm or nearest 0.1 ".
- Circumference, this is the distance around the cylinder, and should be measured roughly half way up the cylinder, using a flexible measuring tape. This must be measured in centimetres for metric units and inches for imperial units. This needs to be measured to the nearest 0.1 cm or nearest 0.1 ".
- Temperature, this should be measured using a Portatherm® temperature probe, or other appropriate method. It should measured around half way up the cylinder and the full readout on the Portatherm® should be entered into the calculator. This must be measured in °C for metric units and °F for imperial units. If not using the Portatherm®, this needs to be measured to the nearest 0.1 °C or nearest 0.1 °F.
- Dome Height, this is the *vertical* height of the domed section at the top of the cylinder, shown as *d* in the diagram overleaf. This should be measured with the ruler or tape held at close to vertical as possible, and not following the curvature of the dome. This is shown as *d* in the diagram below. This must be measured in centimetres for metric units and inches for imperial units. This needs to be measured to the nearest 0.1 cm or nearest 0.1 ".
- Thickness, this is the thickness of the cylinder. It should be measured around half-way up the cylinder using a Portagauge® or other thickness measuring device. The full readout on the Portagauge® should be input into the calculator. This must be measured in millimetres for metric units and inches for imperial units. If not using the Portagauge®, this needs to be measured to the nearest 0.1 mm or nearest 0.1 ".

CO_2 Cylinder

The grey dashed line shows the point at which the cylinder *begins* to curve, it is important that measurements are taken correctly relative to this point.

The red line shows the top of the cylinder, the dome height should not include any components of the valves or tubing at the top of the cylinder.



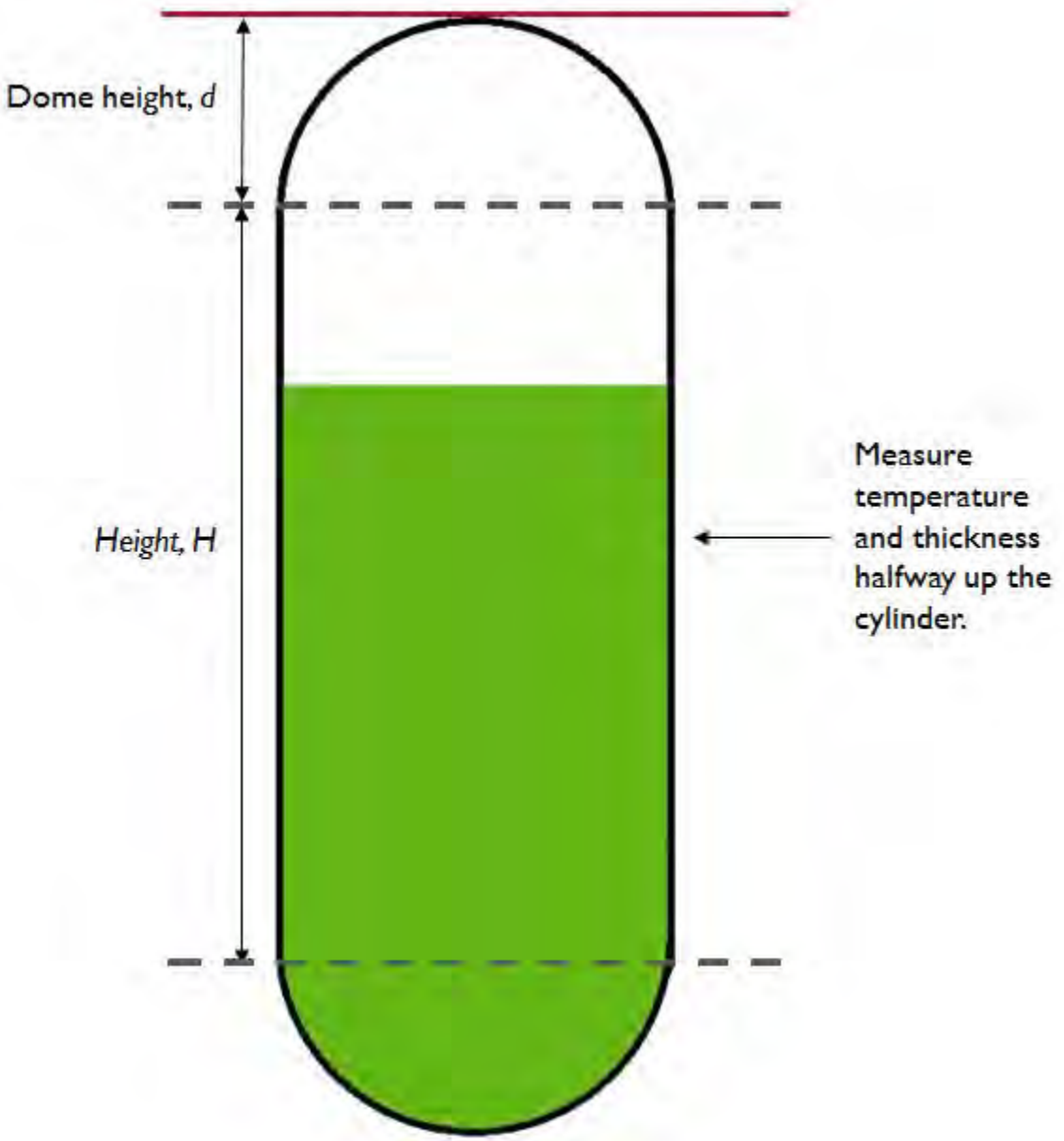
NOVEC 1230

The measurements which need to be taken are:

- Fill Weight, this is the mass of agent with which the cylinder was originally filled, and should be printed on the side of the cylinder. This must be measured in kilogrammes for metric units and pounds for imperial units. This needs to be measured to the nearest 0.1 kg or nearest 1 lb.
- Height, this needs to be measured from the base of the cylinder to the point at which the cylinder begins to curve, shown as *H* in the diagram overleaf. This must be measured in centimetres for metric units and inches for imperial units. This needs to be measured to the nearest 0.1 cm or nearest 0.1 ".
- Circumference, this is the distance around the cylinder, and should be measured roughly half way up the cylinder, using a flexible measuring tape. This must be measured in centimetres for metric units and inches for imperial units. This needs to be measured to the nearest 0.1 cm or nearest 0.1 ".
- Temperature, this should be measured using a Portatherm® temperature probe, or other appropriate method. It should measured around half way up the cylinder and the full readout on the Portatherm® should be entered into the calculator. This must be measured in °C for metric units and °F for imperial units. If not using the Portatherm®, this needs to be measured to the nearest 0.1 °C or nearest 0.1 °F.
- Dome Height, this is the *vertical* height of the domed section at the top of the cylinder, shown as *d* in the diagram overleaf. This should be measured with the ruler or tape held at close to vertical as possible, and not following the curvature of the dome. This is shown as *d* in the diagram below. This must be measured in centimetres for metric units and inches for imperial units. This needs to be measured to the nearest 0.1 cm or nearest 0.1 ".

NOVEC 1230 Cylinder

The grey dashed lines shows the points at which the cylinder *begins* to curve, it is important that measurements are taken correctly relative to these points.
The red line shows the top of the cylinder, the dome height should not include any components of the valves or tubing at the top of the cylinder.



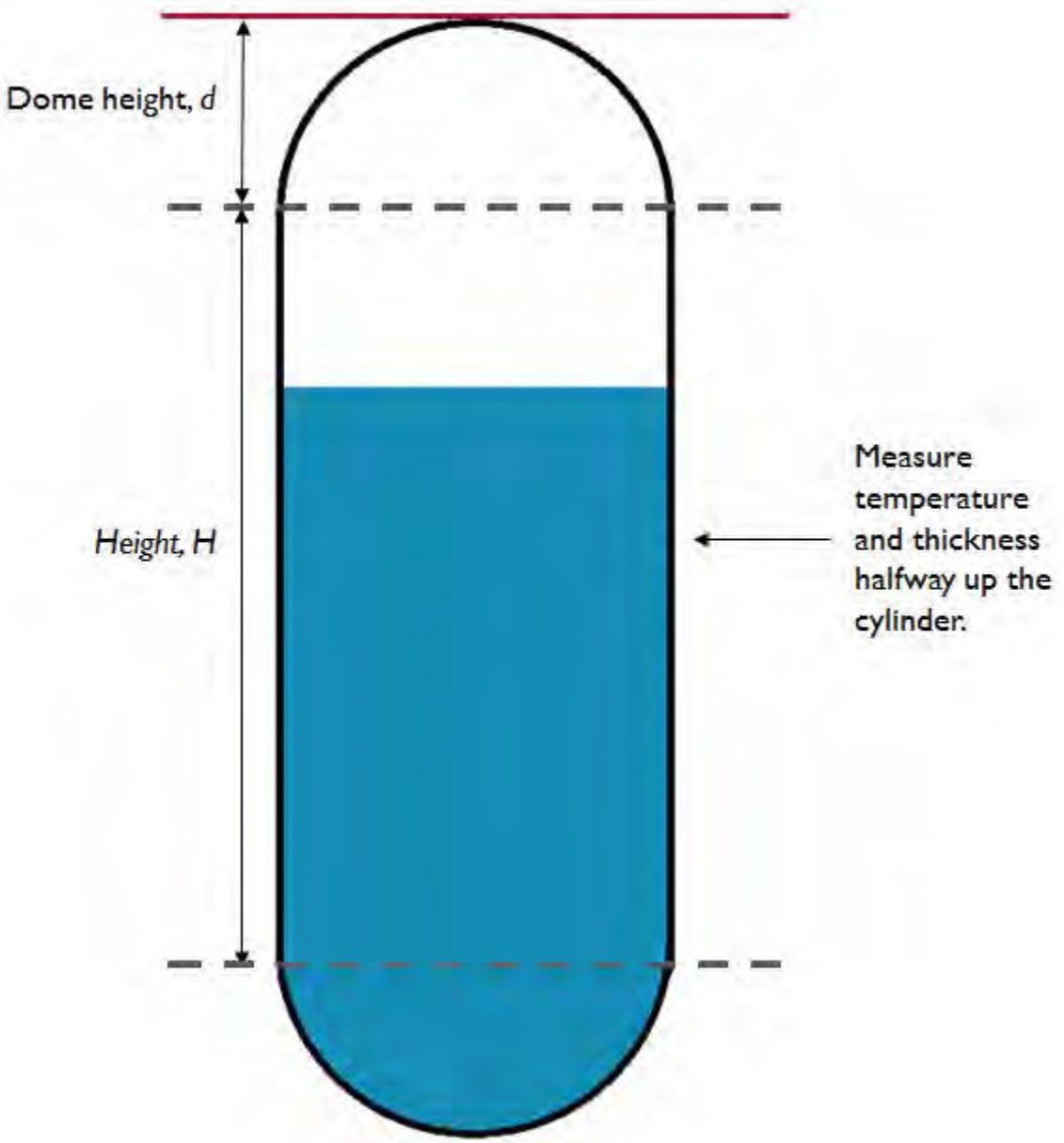
FM-200

The measurements which need to be taken are:

- Actual Agent Mass, this is the mass of agent with which the cylinder was originally filled, and should be printed on the side of the cylinder. This must be measured in kilogrammes for metric units and pounds for imperial units. This needs to be measured to the nearest 0.1 kg or nearest 1 lb.
- Height, this needs to be measured from the base of the cylinder to the point at which the cylinder begins to curve, shown as *H* in the diagram overleaf. This must be measured in centimetres for metric units and inches for imperial units. This needs to be measured to the nearest 0.1 cm or nearest 0.1 ".
- Circumference, this is the distance around the cylinder, and should be measured roughly half way up the cylinder, using a flexible measuring tape. This must be measured in centimetres for metric units and inches for imperial units. This needs to be measured to the nearest 0.1 cm or nearest 0.1 ".
- Temperature, this should be measured using a Portatherm® temperature probe, or other appropriate method. It should measured around half way up the cylinder and the full readout on the Portatherm® should be entered into the calculator. This must be measured in °C for metric units and °F for imperial units. If not using the Portatherm®, this needs to be measured to the nearest 0.1 °C or nearest 0.1 °F.
- Dome Height, this is the *vertical* height of the domed section at the top of the cylinder, shown as *d* in the diagram overleaf. This should be measured with the ruler or tape held at close to vertical as possible, and not following the curvature of the dome. This is shown as *d* in the diagram below. This must be measured in centimetres for metric units and inches for imperial units. This needs to be measured to the nearest 0.1 cm or nearest 0.1 ".
- Thickness, this is the thickness of the cylinder. It should be measured around half-way up the cylinder using a Portagauge® or other thickness measuring device. The full readout on the Portagauge® should be input into the calculator. This must be measured in millimetres for metric units and inches for imperial units. If not using the Portagauge®, this needs to be measured to the nearest 0.1 mm or nearest 0.1 ".

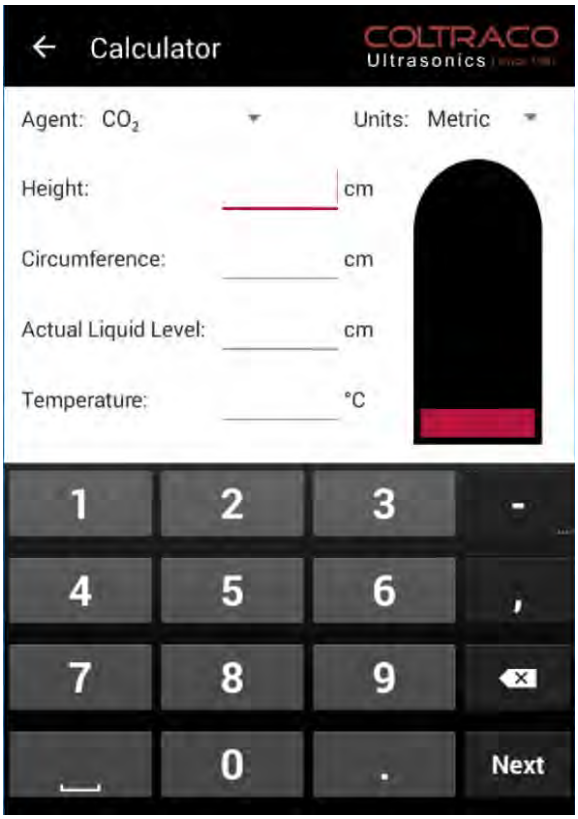
FM-200 Cylinder

The grey dashed lines shows the points at which the cylinder *begins* to curve, it is important that measurements are taken correctly relative to these points.
The red line shows the top of the cylinder, the dome height should not include any components of the valves or tubing at the top of the cylinder.



Performing Calculations

Once all the necessary measurements have been taken to calculate either mass or liquid level, they can inputted into the calculator.



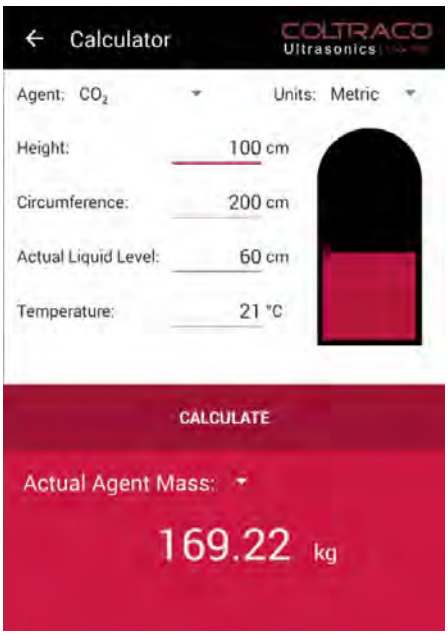
To input measurements, tap in the space above the line next to the corresponding measurement value to be entered. This will bring up the on-screen keyboard, which can then be used to input the measured value.

It is important to enter all the values as precisely as possible (including numbers after the decimal point).

Once all the measurements have been correctly inputted into the calculator, close the keyboard and tap the 'Calculate' below the input boxes.

CALCULATE

If something has been input incorrectly, an error message will appear at the bottom of the screen, detailing what it is that must be changed for the inputs to be valid.



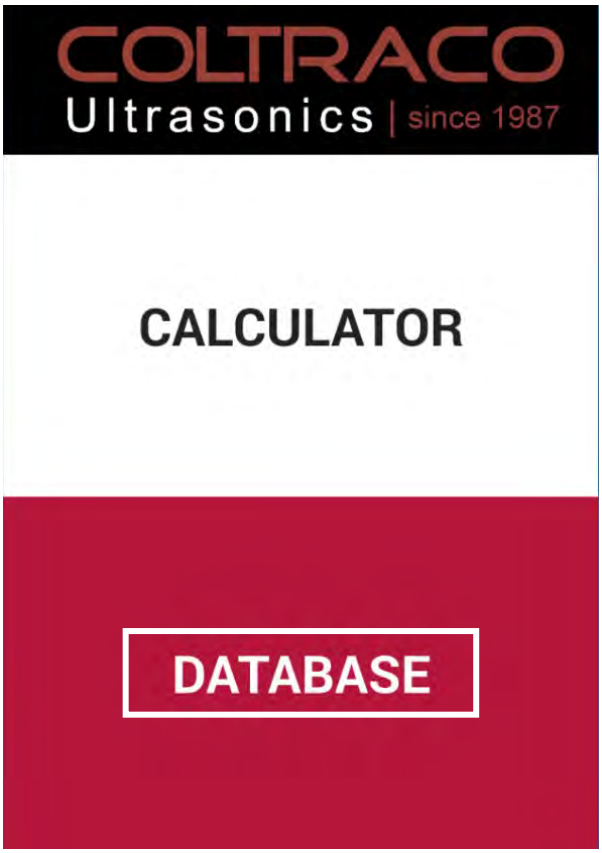
When everything has been input correctly, the liquid level / mass calculated will then be displayed at the bottom of the screen.

4. Database Mode

Cylinder Database

The application also has the ability to create and organize records of cylinder dimensions and calculation results. This means that when cylinders are tested again, the record of their dimensions can be simply opened in the app, rather than having to measure all the cylinders each time they are tested. This makes testing cylinders much more efficient. It also allows many cylinders of the same type and dimensions to be tested quickly, with all the results being stored and then exported with a single click.

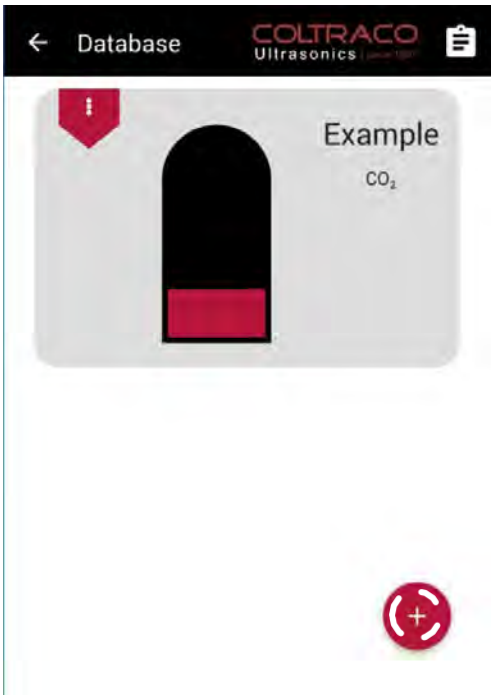
When the application boots it will open onto its home screen.



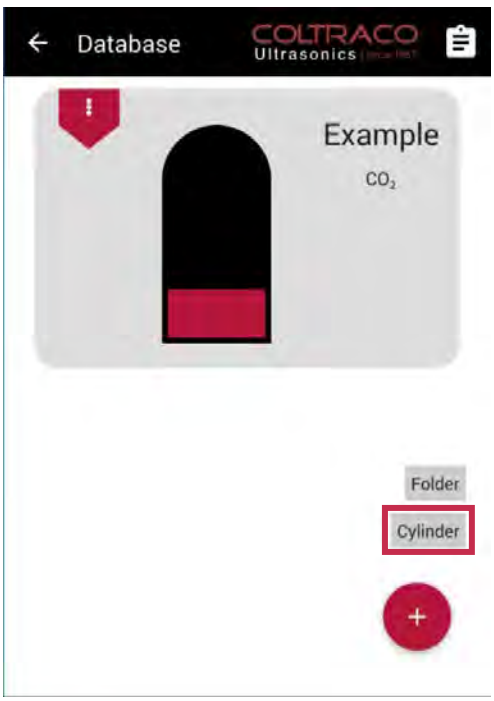
To access the database, select the Database option by tapping on the lower half of the screen as highlighted here.This will open the database into the home folder.

Adding a New Cylinder to the Database

The first time the database is loaded, it will contain only a single example cylinder. New saved cylinders for as many different cylinder types and dimensions as is needed can be added and stored in the database for later use.

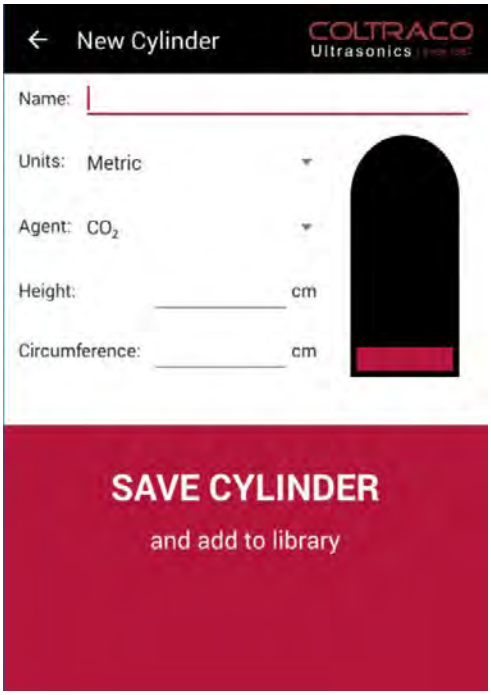


To add a new cylinder to the database, start by clicking the + button in the bottom right, as shown here.



Clicking the + button brings up 2 options: creating a new folder or creating a new cylinder. Choose the second option as shown here to create a new cylinder. This will bring up the New Cylinder creation screen.

The New Cylinder creation screen is very similar to the Calculator Mode as detailed on page 8.The specifications and dimensions of the new cylinder should be input in exactly the same way as in Calculator Mode, the only differences being that the new cylinder being created must be given a unique name to identify it in the database, and that no measured liquid level or mass needs to be inputted, since no calculation is being performed at this stage.



Once all of the required dimensions and cylinder information has been inputted, the cylinder can be added to the database by clicking the Save Cylinder button, as shown here.

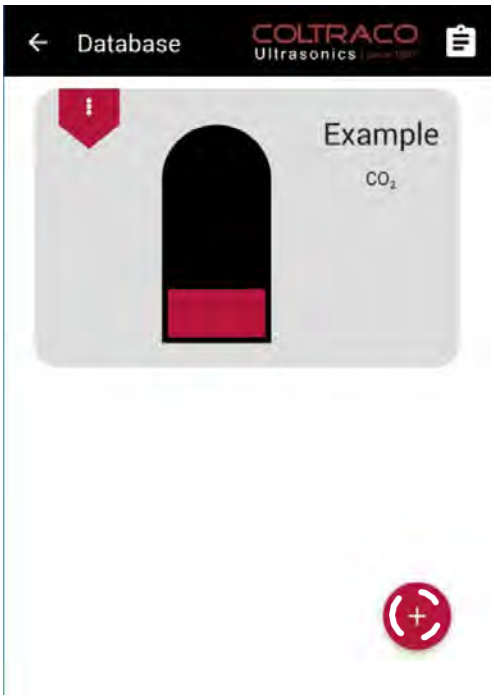
If something has been input incorrectly, an error message will appear at the bottom of the screen, detailing what it is that must be changed for the inputs to be valid.

When everything has been input correctly, the cylinder will be added to the folder you are currently in, and the New Cylinder screen will close, returning to the previous database view.

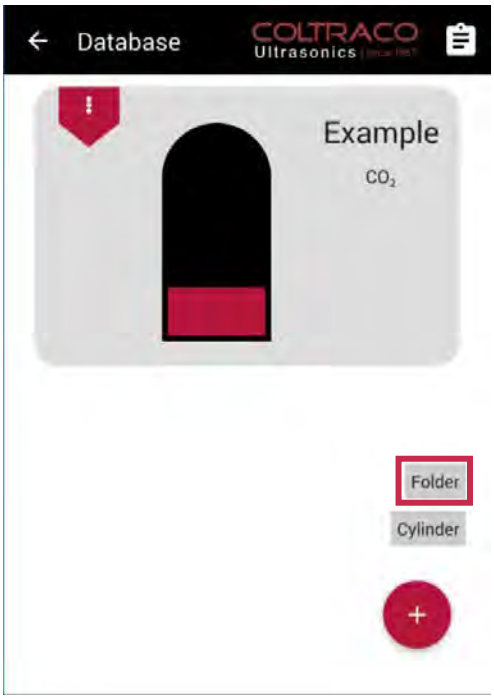
Alternatively, navigating back by using the back key or the back arrow in the top left of the screen will cancel the creation of the new cylinder, and any input will be lost.

Adding a New Folder to the Database

In addition to adding cylinders to the database, new folders and sub-folders can also be created.Within every folder, new cylinders and sub-folders can be created, allowing cylinders to easily be organized.

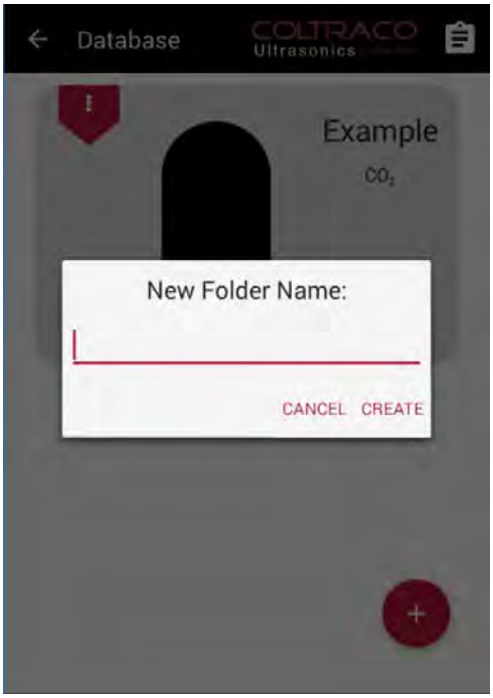


To add a new folder to the database, start by clicking the + button in the bottom right, as shown here.



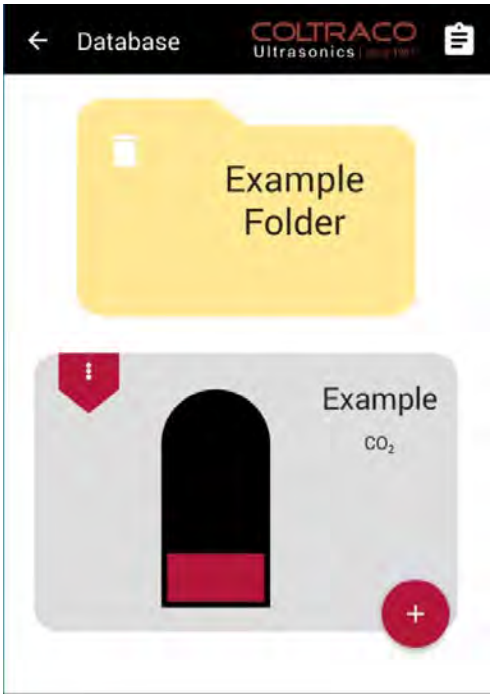
Clicking the + button brings up 2 options: creating a new folder or creating a new cylinder. Choose the first option as shown here to create a new folder.

A dialog will now pop up to name this new folder.



Simply click in the input box to bring up the on-screen keyboard, and use it to enter a unique name for this new folder.

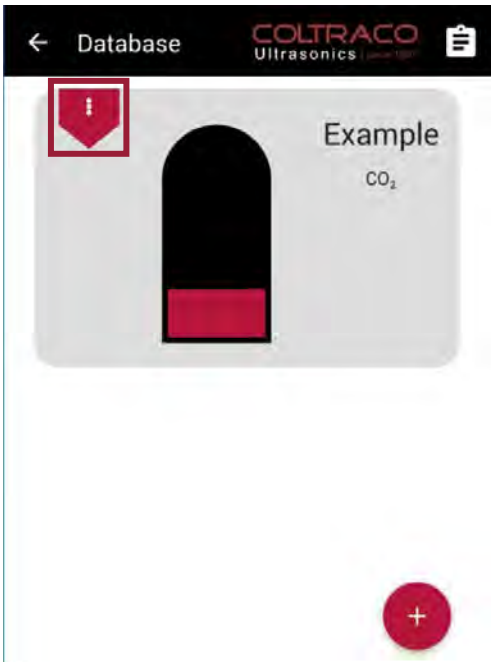
Selecting the Create button will then add this new folder to the database.Alternatively, select the Cancel button to abandon creating this new folder.



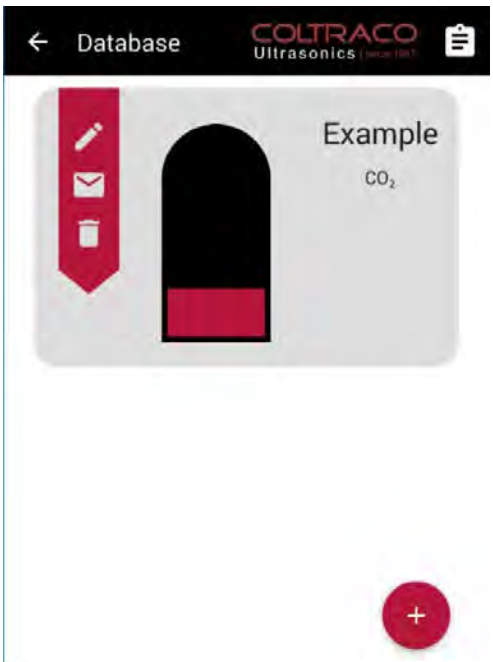
Upon choosing to create this new folder, it will be added to the database.

Managing Saved Cylinders

The first time the database is loaded, it will contain only a single example cylinder. Saved cylinders can be managed from their drop down ribbon, located to the left of the cylinder image.



The first time the database is loaded, it will contain only a single example cylinder.
Saved cylinders can be managed from their drop down ribbon, located to the left of the cylinder image as shown here.

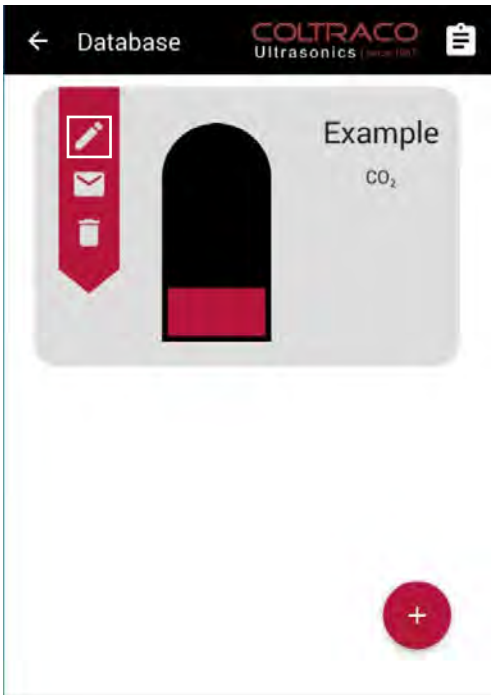


Clicking on the collapsed ribbon will open it up, showing the 3 cylinder management functions.
They are:

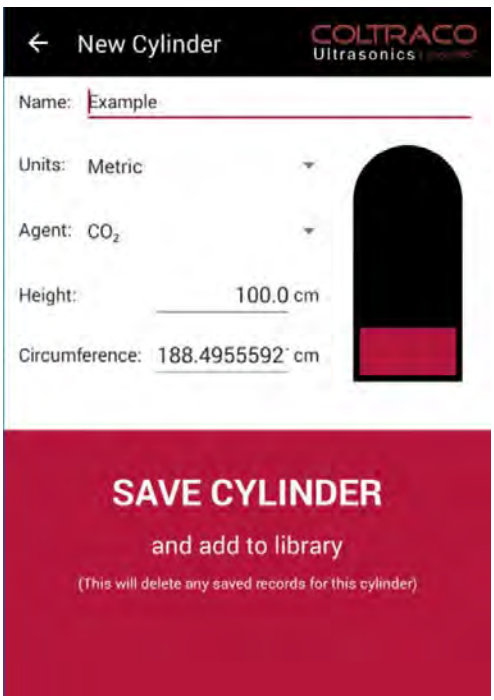
1. Edit
2. Export
3. Delete

Editing Saved Cylinders

The first cylinder management option of the drop down ribbon allows the saved dimensions and information of a cylinder to be edited.



Start by clicking on the first item in the drop down ribbon as shown here.This will bring up the cylinder editing screen.



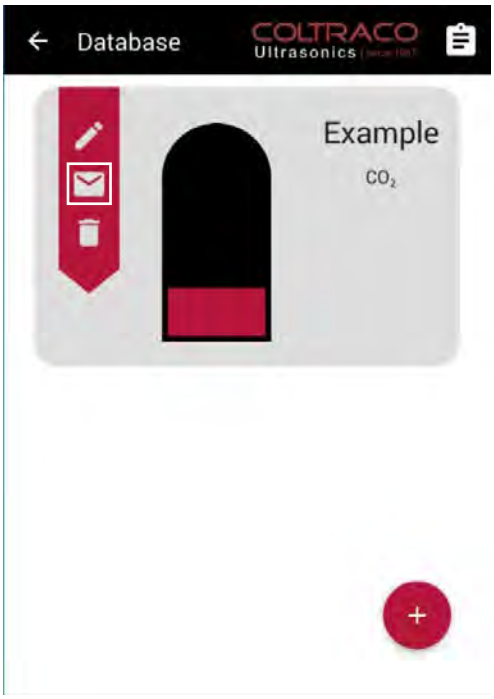
The editing screen is identical to the New Cylinder creation screen detailed on page 29, except that the information input boxes are pre-filled with the current information stored for this cylinder.This information can be altered in exactly the same way as detailed on page 25.

Once the cylinder information is finished being edited, these changes can be committed by clicking the Save Cylinder button, as shown here. In the same way as when creating a new cylinder, this will display an error if any inputs are invalid, as detailed on page 29.When everything has been input correctly, any changes will be committed and applied to the saved cylinder in the database, and in doing so will overwrite any stored calculation results for this cylinder (see page XX for more on storing calculation results.

Alternatively, navigating back by using the back key or the back arrow in the top left of the screen will abandon any changes made to the cylinder being edited.

Exporting Saved Cylinders

The second cylinder management option of the drop down ribbon allows the saved dimensions and information of a cylinder to be exported via email.

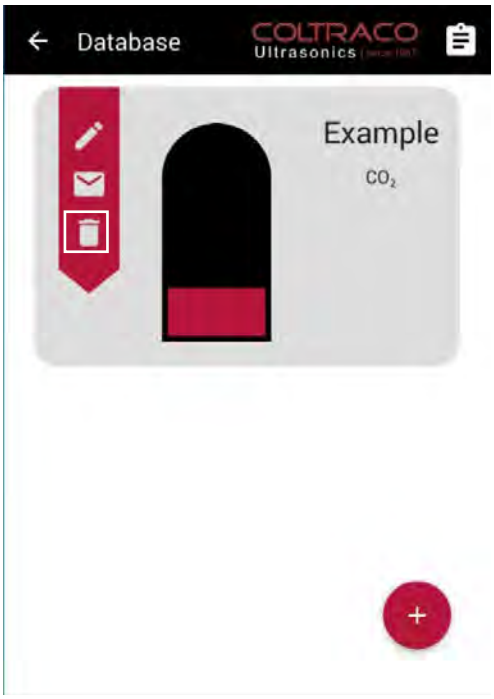


Start by clicking on the second item in the drop down ribbon as shown here.This will bring up the email client if an email account has already been setup, otherwise it will prompt you to do so.

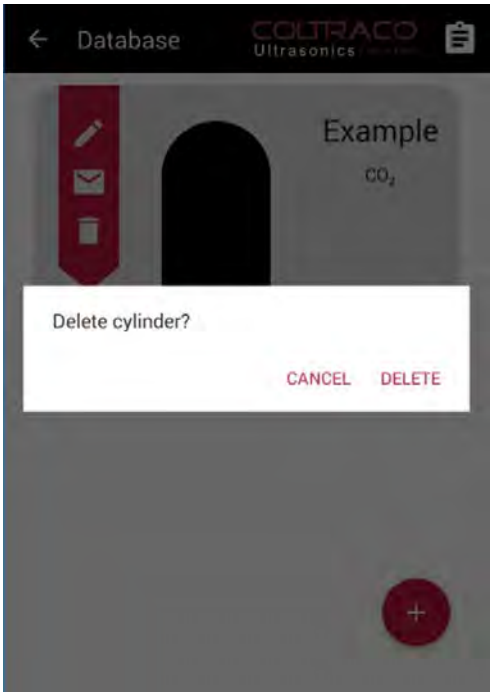
Once an email address has been successfully setup, the application will write a new email and fill it with the information and dimensions of the selected cylinder. This email will be sent from the email account setup on the tablet, and can be sent to any email address chosen, including the same address it is being sent from.

Deleting Saved Cylinders

The final cylinder management option of the drop down ribbon allows a cylinder to be completely removed from the database.



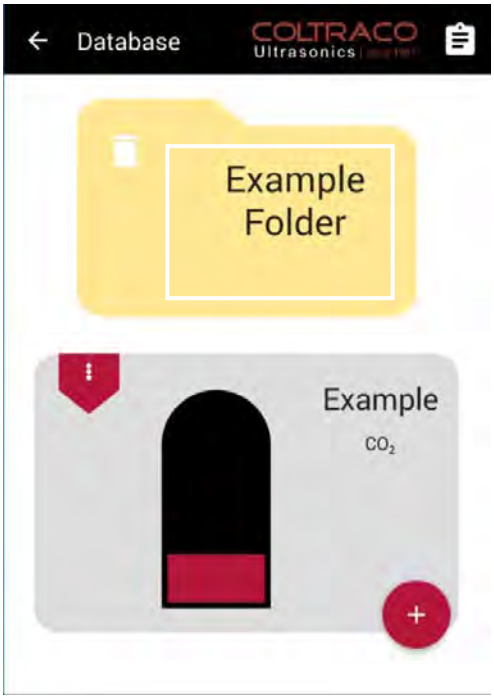
Start by clicking on the third item in the drop down ribbon as shown here.This will then prompt the application to check that you really wish to delete the selected cylinder.



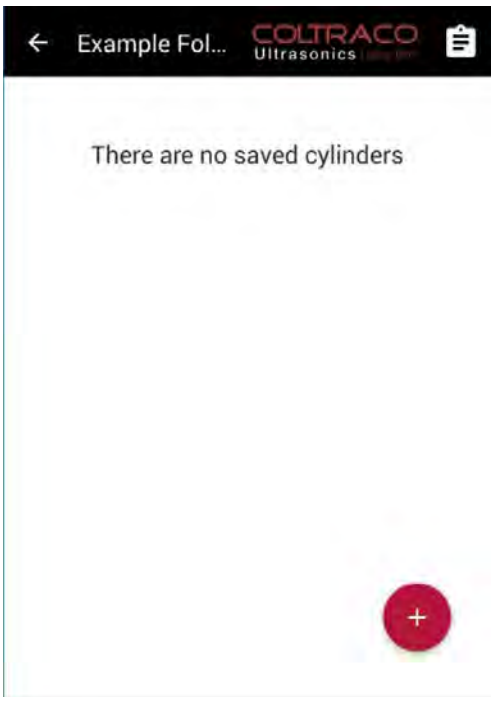
Simply choose Delete to completely remove the selected cylinder, otherwise choose Cancel to keep the cylinder in the database.

Navigating the Database

After creating new folders, they can be opened and dealt with in the same way as the home folder.

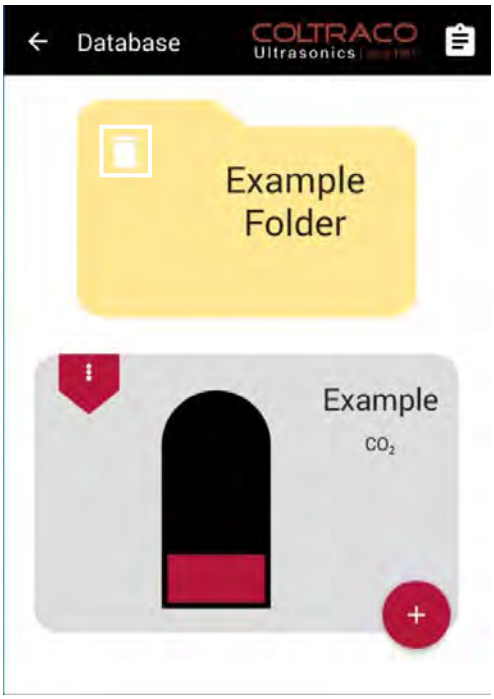


When the database first opens it will be in its home folder. Clicking on a folder will open the selected folder and navigate into this sub-folder.



Any cylinders and folders within the folder selected will now be displayed, and can be managed in exactly the same way as those in the home folder. New folders and cylinders can also be created within the current folder in exactly the same way as detailed previously.

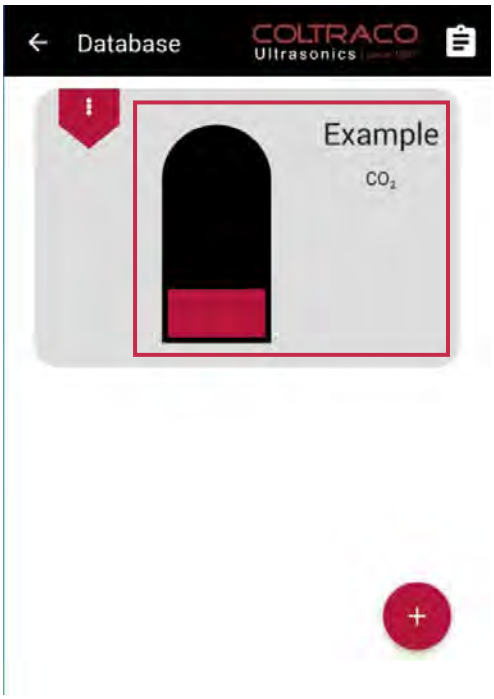
To navigate upwards in the file system, use the back button or the back arrow in the top left of the screen in order to navigate a single level upwards. In order words, this means you will be navigating into the folder containing the current folder you are within. Navigating upwards within the home folder will save and close the database.



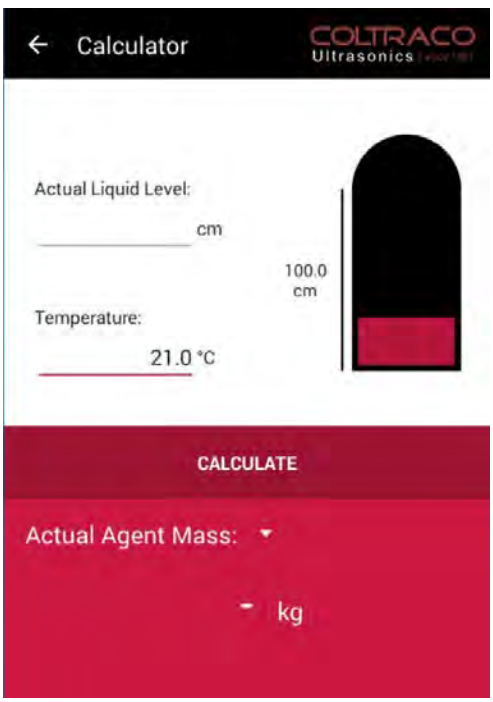
Any sub-folder in the database can be deleted by clicking on the delete icon in the upper left of the folder. This will prompt the application to check that you really wish to completely remove the folder and everything contained within it in the same way as detailed on page 35.

Performing Calculations on Saved Cylinders

After creating saved cylinders, calculations can be performed using this cylinder information.

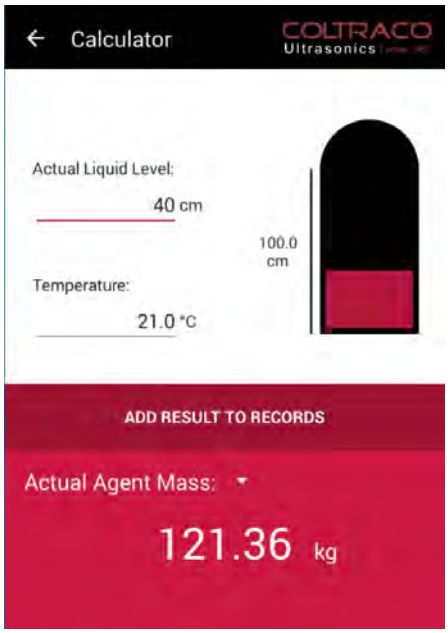


To perform a calculation on a cylinder, simply click on the selected cylinder. This will open up the saved cylinder calculator.

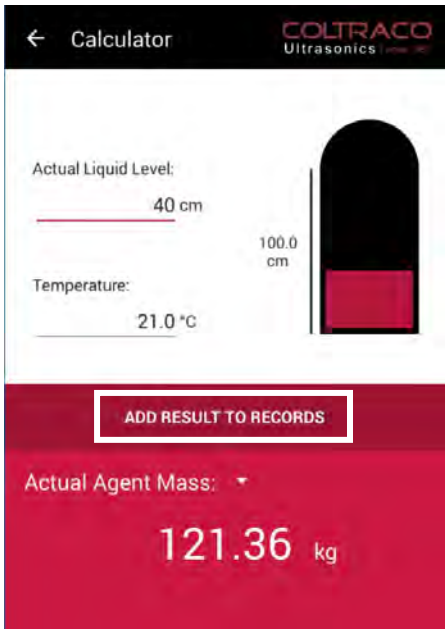


This saved cylinder calculator is very similar to Calculator mode as detailed on page 8, except that the only 2 inputs which can be altered are Temperature and either Actual Liquid Level or Actual Agent Mass, depending on what is being calculated.

Once all the measurements have been correctly inputted into the calculator, close the keyboard and tap the 'Calculate' below the input boxes, in the same way as for Calculator mode, as detailed on page 26.



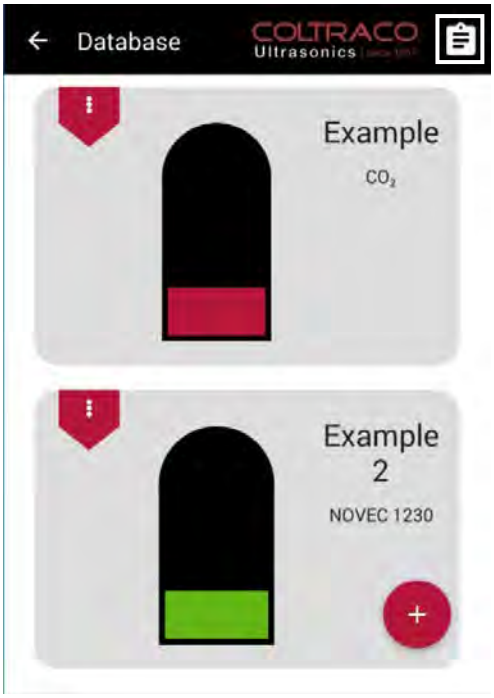
Also in the same way as in Calculator mode, if something has been input incorrectly, an error message will appear. Otherwise the calculation result will appear at the bottom of the screen, as shown here.



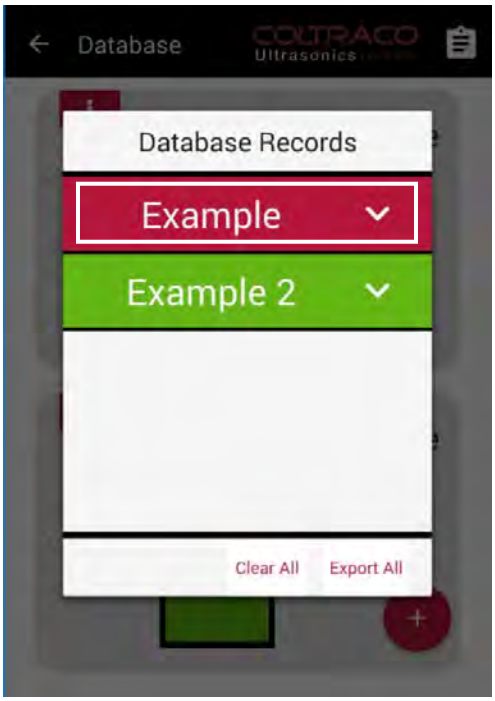
After calculating the result, it is possible to add this result to a list of stored results for this specific cylinder. This can be done by clicking the Add Result To Records button, which is shown here. Every result can be added to the records multiple times, and will bring up a message saying how many times the current result has been stored.

Managing Calculation Records

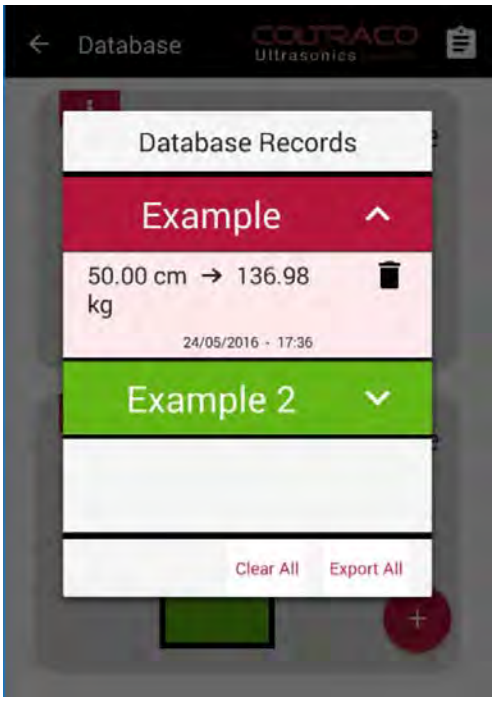
After storing cylinder calculation results, they can be viewed, managed and exported from Database Records.



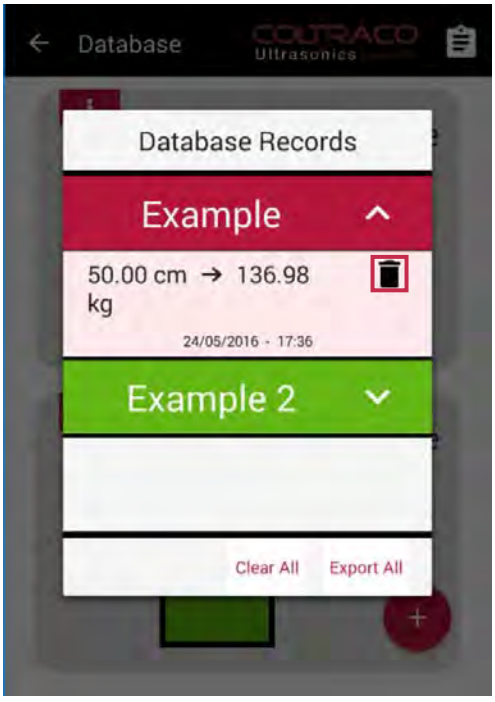
To open up Database Records, simply click the Records icon as seen here.



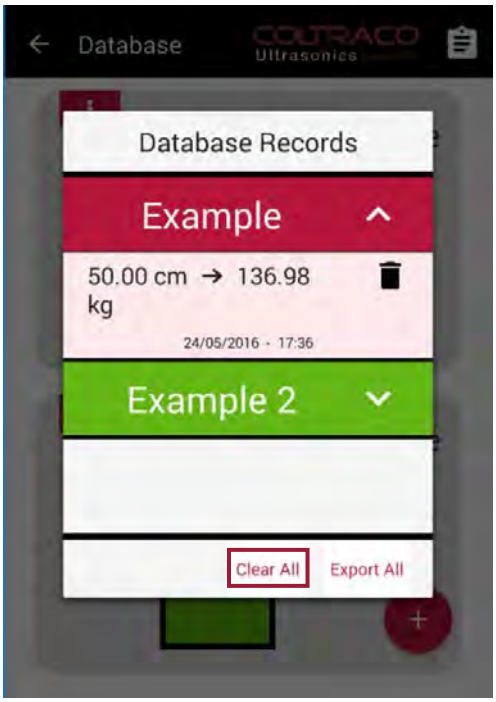
The Database Records organize calculation results by cylinder, as can be seen here.To view the results for a certain cylinder, simply click on the selected cylinder's name.This will open up a drop down list of results.



Opening up the records for a cylinder will show all of the stored records for that cylinder, organized by how new the record is, as seen here.



A record can be removed by clicking the delete icon, as shown here. This will permanently remove the selected result from the records.



It is also possible to remove every record for every cylinder in Database Records, by clicking the Clear All button, as shown here.

Exporting Calculation Records

It is possible to export all of the calculation results stored in Database Records via email with a single click.

Start by clicking the Export All button, as shown here. This will bring up the email client if an email account has already been setup, otherwise it will prompt you to do so.

Once an email address has been successfully setup, the application will write a new email and fill it with the calculation results from every cylinder. These results are organized by cylinder, and are color-coded according to how full the cylinder was according to the liquid level either input or calculated. This email will be sent from the email account setup on the tablet, and can be sent to any email address chosen, including the same address it is being sent from.

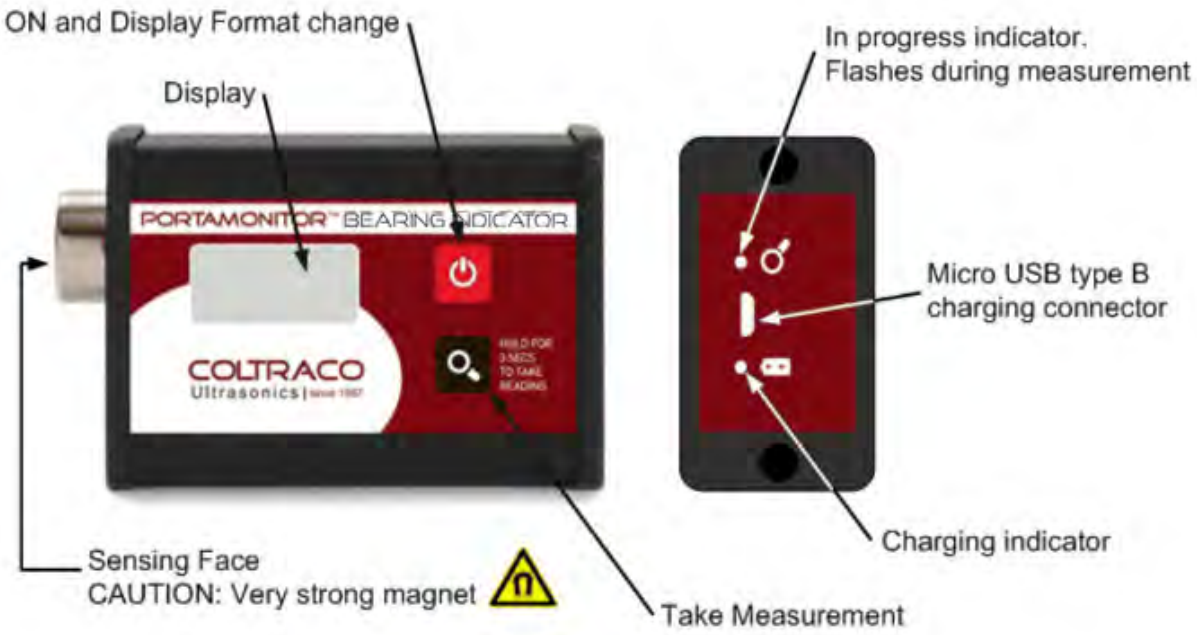
5. Maintenance

Basic maintenance of the tablet involves simple procedures such as recharging the battery. Any major maintenance is carried out by the technical team. Please contact service@sdifire.com for any queries.

PORTAMONITOR®

USER MANUAL

1. Layout


ON and Display Format change
Display
PORTAMONITOR™ BEARING INDICATOR
COLTRACO
Ultrasonics
Sensing Face
CAUTION: Very strong magnet
Take Measurement
In progress indicator.
Flashes during measurement
Micro USB type B
charging connector
Charging indicator

2. Introduction and Intended Use

The BEARING INDICATOR is a state-of-the-art Condition Monitoring instrument with extreme sensitivity to detecting faults. The BEARING INDICATOR aids the detection of mechanically deteriorated bearings in operating machinery. It can also identify those having inadequate lubrication or lubricant contamination.

Utilising an established and unique approach to signal detection and processing, the BEARING INDICATOR monitors bearings in motors, pumps, fans, gearboxes and other rotating machinery applications.

BEARING INDICATOR readings provide insight into the planning of future repair actions and assist in identifying the need for improved lubrication.

3. Maintenance, Service & the Environment

3.1. Cleaning

The outer case does not require cleaning during normal use. If the case becomes soiled, wipe clean with a soft cloth or tissue.
The sensing face should be kept clean and free of grit and debris.
The sensing face can be degreased as necessary using a mild detergent.
Do not use aggressive chemicals.

3.2. Service and Calibration

SDi recommends that the BEARING INDICATOR is serviced, checked and calibrated regularly through an authorized SDi service provider. The recommended recalibration period is 12 months.

The BEARING INDICATOR contains no user serviceable parts. Do not attempt to dismantle. Contact SDi for service and repair.

4. Safety Summary

The sensing face of the BEARING INDICATOR contains a very strong magnet and should never be positioned in the vicinity of sensitive electrical/electronic equipment (for example; pacemakers or other sensitive medical equipment) or magnetic storage media such as hard disk drives.

Do not carry out any instruction in this manual if it may cause risk of physical injury, damage to machinery, would be against site rules or could adversely affect products or processes.

Wear Personal Protective safety equipment appropriate to the area and potential hazards where measurements are to be made.

Never use the BEARING INDICATOR on or near exposed moving parts. Never override safety systems in order to gain access to operating machinery. Take care to avoid physical injuries when taking measurements.

To avoid the risk of personal injury, only use the BEARING INDICATOR on electrically grounded (earthed) machinery. Never use the BEARING INDICATOR on live electrical surfaces.

The BEARING INDICATOR could reach extremes of temperature when placed on HOT or COLD machines. Take precautions to avoid skin damage when handled.

The BEARING INDICATOR is NOT approved for use in HAZARDOUS ATMOSPHERES.

5. Distress and dB level

The BEARING INDICATOR outputs two key values to aid condition monitoring:

dB Level	Indicates an average of the measured signal level.
Distress®	Indicates the level of transient activity of the signal.

6. Operation

6.1. Switching BEARING INDICATOR ON and OFF

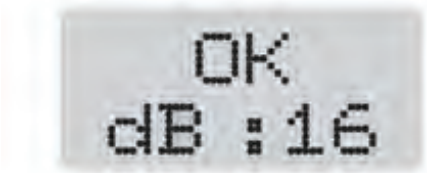
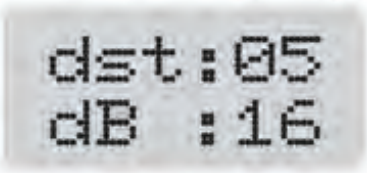
Press the button to turn the unit on. The BEARING INDICATOR briefly displays its serial number and software version. The last measurement taken is then displayed.

The BEARING INDICATOR switches off automatically after 30 seconds of inactivity.

6.2. Distress® Display Format

To assist the effectiveness of general measurement taking, the display of the BEARING INDICATOR can show a qualitative output to aid the interpretation of results. The Distress® Quality mode is based on typical diagnostics for bearings.

To toggle between the modes, Press for 3 seconds.

Distress® Quality Mode	Distress® Numeric Mode
OK	Distress® (dst) <10
Suspect	Distress® (dst) >10 <15
Poor	Distress® (dst) >15
	

"Too low" is displayed when there is insufficient signal being detected to allow a Distress® reading to be taken.

7. Taking Measurements

7.1. Mounting location

The sensing face needs to be acoustically coupled to a static part of a machine's external casing containing the bearing to be monitored. Positioning and orientation of the sensor is not critical although highest signal levels will be detected in the immediate vicinity of the bearing - avoid flimsy cowls, guards and nameplates. Make sure the surface is clean and free of grit and debris.

7.2. Fitting to the machine

Use a pea sized amount of a suitable GREASE or GEL between the BEARING CATOR sensing face and the machine (1).

With the unit switched on, Press the button for 3 seconds.

The display then shows 10 second countdown. Place the edge of the sensing face gently on the machine (2), then roll the BEARING INDICATOR into place (3). Twist the BEARING INDICATOR to spread the grease under the sensing face - this also allows the presence of debris to be felt (4).

Follow the GREASE or GEL supplier's instructions on its use, particularly with regard to skin irritant effects or contamination of the environment, nearby processes or product.

1:

2:

3:

4:

7.3. Displaying Readings

After the countdown, the BEARING INDICATOR takes measurements for a further 10 seconds; the Measurement in progress light will flash. Measured values of Distress® and dB are then displayed.

7.4. How to get the best from the BEARING INDICATOR

Do not move the BEARING INDICATOR during measurements and ensure nothing is touching the BEARING INDICATOR as this can affect the readings.

Distress® readings may appear artificially high if the BEARING INDICATOR case catches on anything or the sensing face moves on the machine surface during the measurement.

To avoid measurement errors, use the magnetic sensing face to attach the BEARING INDICATOR rather than hold the BEARING INDICATOR.

If a high reading is observed, it is recommended that a second measurement is taken to confirm the first result.

For consistency, repeatability and trending, measurements should be made at the same point(s) on any particular machine.

8. Charging

Recharge the BEARING INDICATOR using the USB cable supplied – the charging indicator lights up whilst charging is in progress. The USB port should have a standard 500mA output – some low powered hand-held devices may not supply enough power.

Recharging takes approx 4 hours from a standard USB port.

9. Typical Interpretation of Readings from Bearings

For progressive bearing deterioration due to pitting of race or rolling element surfaces in rotating machinery, the usual observation of readings is as follows:

Wear Stages		Distress®		dB Level
		Numeric	Quality	
1	Good condition	<10	"OK"	Lowest for machine.
2	(Not always seen) First signs of a possible problem. Occasional impacts from surface damage.	Repeated measure-ments only >10 occasionally	Either "Suspect" or "OK"	Typically Lowest for machine.
3	The problem becomes established. Copious impacts from surface damage.	Consistently >10	Either "Suspect" or "Poor"	Slightly increased from normal.
4	Continuing to degrade. Sufficient damage to cause increased frictional activity.	Usually >10 (may be less in later stage)	Any: "OK" "Suspect" or "Poor"	Successive dB readings increase.
5	The approach to final failure. Severe fictional activity (note 1).	Usually drops to <10	Either "Suspect" or "OK"	Increased to >20dB higher than normal.

note 1: Bearings in the later stages of failure, especially when dB Levels have increased significantly, may show reduced values of Distress®. It is therefore recommended that historical trends are observed when interpreting results.

Not all fault conditions follow the above progression. For example high frictional activity from the outset would give a high dB and possibly a low Distress®, whereas a bearing spinning in its housing usually gives a high Distress® and an abnormally low dB. In addition, improving bearing lubrication – especially in the early stages, often gives a reduction in Distress® and may delay further deterioration.

10. Applicability

"Too Low" is displayed when there is insufficient signal being detected to allow a reading to be taken and it is below the sensitivity of the BEARING INDICATOR. Try to improve the coupling of the sensor face to the machine or select an alternative location.

The BEARING INDICATOR is not in general suitable for monitoring reciprocating machinery, hydraulic power packs, inverter driven or synchronous motors. Distress® is not recommended for use on machinery above 2,500 rpm.

Split bearing housings may produce high Distress® readings even when in good condition – trending values may identify deterioration.

11. Technical Specification

Sensor General

Sensing element: Resonant piezoelectric at ~ 100 kHz

Calibration: Factory set to within 1 dB of standard value

Signal Measurement

Distress® (dst)	Description:	Fault indicating parameter
	Range:	0 to > 40 (typical)
	Resolution:	1 unit
dB Level (dB)	Description:	Logarithmically scaled mean signal level
	Range:	up to 80 dB
	Resolution:	1 dB

General Characteristics

Internal Battery	Typically >1000 measurements between charges
	"Low battery" message flashes on LCD display
Operating Temperature:	0 to +65 °C
Dimensions:	98 x 62 x 34mm (W x H x D) (inc. sensing face)
Weight:	250g

12. Disclaimer and General information

The BEARING INDICATOR assists in making service and maintenance decisions. It does this by detecting high frequency stress waves associated with energy loss mechanisms such as friction and impacts that are naturally produced by machinery in poor condition. The technology is known as Acoustic Emission or AE. The BEARING INDICATOR is not sensitive to low frequency activity such as that associated with vibration or audible sound.

This manual provides practical advice on the use of the BEARING INDICATOR and general guidelines for interpreting its readings. No such general guidelines, or indeed no such general purpose Condition Monitoring instrument, can be guaranteed to provide the information required in all cases. Therefore it is recommended that the BEARING INDICATOR complements existing methods and procedures for dealing with service, maintenance and repair of machinery.

Since SDi has no control over the machinery to which the BEARING INDICATOR will be applied, the care taken during its use, or the appropriateness of any actions taken, SDi cannot accept any responsibility or liability for any consequential loss howsoever arising from the use of the BEARING INDICATOR.

13. Warranty

The warranty (for the period specified at the time of purchase) is inclusive of all parts and labor costs subject to the exclusions listed. The decision to repair or replace defective product will be at the discretion of SDi. The warranty shall not apply to defects, damage or loss resulting from:

- Unauthorized modification or misuse
- Operation outside the environmental specification
- Fair wear and tear
- Accidental damage
- Cost of shipping back to SDi
- In no event will SDi be liable for any consequential or incidental damages including lost profits, savings or any claim by any party.

14. Support

If you have any technical or after-sales queries please contact Technical Support; service@sdifire.com (732)-751-9266

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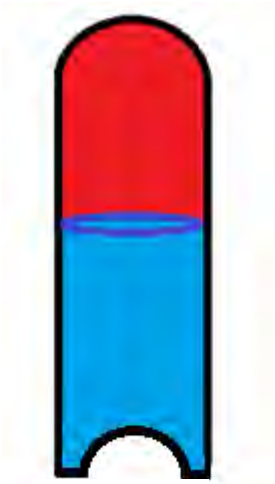
Instructions for Calculation of Mass or Liquid Level of Agent

Before beginning any calculations, please note whether the bottom of the cylinder is similar to

Cylinder 1 or **Cylinder 2**. This is important because the set of instructions for the calculations depend on the type of cylinder. Below is a list of agents which are usually found in each type of cylinder:

- **Cylinder 1** – CO_2
- **Cylinder 2** – NOVEC™ 1230, FM-200™, FE-13™, FE-25™, FE-36™, NAF-S-111, 125 & 127, Halon 1301



Cylinder 1

Cylinder 2

- **Numbers should be rounded for accuracy, for example 1473 rounded to 3 figures is 1470 (it has three numerical figures in). However 0.05968 would be rounded to 0.0597 as the two 0 figures at the beginning of the number do not count. 103.8 would be rounded to 104 because a 0 figure does count as soon as it appears *after* another number.**

Type all calculations into a calculator as displayed.

Units

- All the distance measurements in this document are in centimetres (cm) and all the mass measurements are in kilograms (kg).

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- To convert a value in metres (m) to centimetres (cm), multiply the value by 100. (1m=100cm).
- To convert a value in millimetres (mm) to centimetres (cm), divide the value by 10. (1cm=10mm).
- To convert a value in grams (g) to kilograms (kg), multiply the value by 1000. (1kg=1000kg).

Cylinder 1 - Calculating Mass of Agent from Liquid Level

Initially several measurements need to be taken and written down:

1. Liquid level, ***l***, this should be measured from the base of the cylinder in centimetres. (The liquid level can be measured using a Portalevel)

2. Circumference of the cylinder, ***c***, in centimetres. This is the distance all the way around the cylinder.

3. Thickness, ***t***, which is the thickness of the wall of the cylinder in centimetres. This can be measured using a thickness gauge.

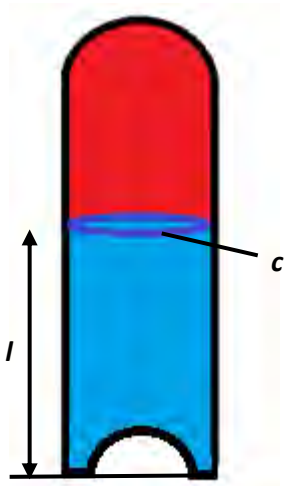

Figure 1.

The overall equation used to calculate the mass is:

$$m = (d \times 3.14 \times (r - t) \times (r - t) \times l) \div 1{,}000{,}000$$

The steps below explain how to use this equation

a) Calculate the radius of the cylinder: divide the measured value of circumference, ***c***, by 6.28 and write this down

b) Subtract the value of the thickness from the radius: radius – ***t*** and write this down

c) Square the number calculated in (b): multiply it by itself (e.g. (b) x (b)) and write this down

d) Look at the table on the last page. Find the correct agent and temperature and identify the value of density, ***d***, to use

e) Then calculate: density x 3.14 x the value from (c) x liquid level and write this down

f) Divide the value calculated in (e) by 1,000,000 and this is the agent mass in kilograms.

Example Calculation

An example is given below

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The measurements used in the example are displayed in the table below.

c	*t*	*d*	*l*
85 cm	0.7 cm	773	106

a) Calculate the radius: circumference divided by 6.28

$$r = c \div 6.28 = 85 \div 6.28$$
$$= 13.5$$

Write down: r = 13.5

b) Subtract the value of the thickness from the radius

$$r - t = 13.5 - 0.7$$
$$= 12.8$$

Write down: (b) = 12.8

c) Multiply the number calculated in step (b) by itself

$$(b) \times (b) = 12.8 \times 12.8$$
$$= 163.8$$

Write down: (c) = 163.8

d) Identify the correct value of density to use from table (page 10). For example, a cylinder of CO_2 at a temperature of 68 ^{o}F has ***d*** = 773

e) Calculate: density x 3.14 x (c) x liquid level

$$d \times 3.14 \times (c) \times l = 773 \times 3.14 \times 163.8 \times 106$$
$$= 42,143,335$$

Write down: (e) = 42,143,335

f) Divide the number in (e) by 1,000,000

$$42,143,335 \div 1,000,000 = 42.1$$

The mass of agent in the cylinder is <u>42.1 kg</u>. It has been rounded to 3 figures.

<u>Cylinder 1 - from</u>

Measurements needed to calculate the mass of agent:

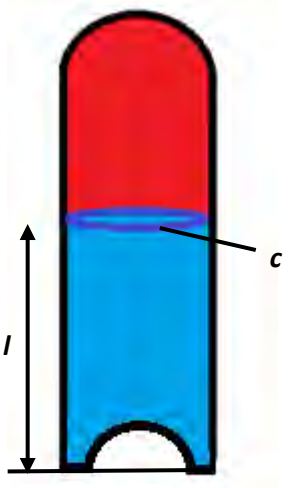

Figure 1.

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1. Mass of the full cylinder, w in kilograms, found by weighing the cylinder that has the agent in it
2. Mass of the empty cylinder (i.e. when it has no agent in it), e, in kilograms. This is often printed on the side of the cylinder or is available from the manufacturer.
3. Circumference of the cylinder, c, in centimetres. This is the distance all the way around the cylinder.
4. Thickness, t, which is the thickness of the wall of the cylinder in centimetres. This can be measured using a thickness gauge.

The overall equation used to calculate the liquid level is

$$l = m \times 1{,}000{,}000 \div (d \times 3.14 \times (r - t)^2)$$

The steps below explain how to use this equation

a) Calculate the radius of the cylinder: divide the measured value of circumference, ***c***, by 6.28 and write this down

b) Subtract the value of the thickness from the radius: radius – ***t*** and write this down

c) Square the number calculated in (b): multiply it by itself (e.g. (b) x (b)) and write this down

d) Look at table (page 10). Find the correct agent and temperature and identify the value of density, ***d***, to use

e) Calculate the agent mass, ***m***, subtract the empty cylinder mass from the full cylinder mass and write this down.

f) Then calculate: density x 3.14 x the value from (c) and write this down

g) Divide the value in (e) by (f) and write this down

h) Multiply the value in (g) by 1,000,000 and this is the liquid level in centimetres

<u>Example Calculation</u>

An example is given below. The measurements used in the example are displayed in the table below:

c	*t*	*d*	*w*	*e*
85 cm	0.7 cm	773	121 kg	76 kg

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a) Calculate the radius: circumference divided by 6.28

$$r = c \div 6.28 = 85 \div 6.28$$
$$= 13.5$$

Write down: r = 13.5

b) Subtract the value of the thickness from the radius

$$r - t = 13.5 - 0.7$$
$$= 12.8$$

Write down: (b) = 12.8

c) Multiply the number calculated in step (b) by itself

$$(b) \times (b) = 12.8 \times 12.8$$
$$= 163.8$$

Write down: (c) = 163.8

d) Identify the correct value of density to use from table (page 10). For example, a cylinder of CO_2 at a temperature of 68°F has ***d*** = 773

e) Calculate the agent mass, ***m***: full cylinder mass – empty cylinder mass

$$m = w - e = 121 - 76$$
$$= 45$$

Write down (e) = 45

f) Calculate: density x 3.14 x (c)

$$d \times 3.14 \times (c) = 773 \times 3.14 \times 163.8$$
$$= 397,579$$

Write down (f) = 397,579

g) Calculate (e) ÷ (f)

$$(e) \div (f) = 45 \div 397,579$$
$$= 0.0000113$$

Write down (g) = 0.0000113

h) Calculate (g) x 1,000,000

$$(g) \times 1,000,000 = 0.0000113 \times 1,000,000$$
$$= 113$$

The liquid level of agent in the cylinder is <u>113 cm</u>. It has been rounded to 3 figures.

Cylinder 2 - Calculating Mass of Agent from Liquid Level

Initially several measurements need to be taken and written down:

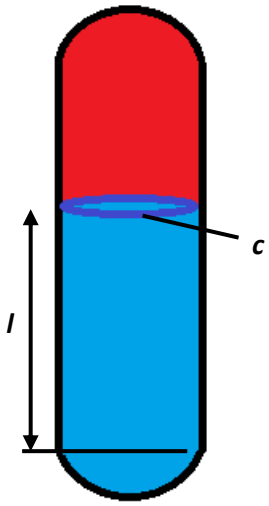

Figure 2.

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1. Liquid level, ***l***, this should be measured from the base of the cylinder in centimetres. (The liquid level can be measured using a Portalevel)
2. Circumference of the cylinder, ***c***, in centimetres. This is the distance all the way around the cylinder.

The overall equation used to calculate the mass is:

$$m = \left(d \times 3.14 \times r^2 \times l\right) \div 1{,}000{,}000$$

The steps below explain how to use this equation

a) Calculate the radius of the cylinder: divide the measured value of circumference, ***c***, by 6.28 and write this down

b) Square the number calculated in (a): multiply it by itself (e.g. (a) x (a)) and write this down

c) Look at table (page 10). Find the correct agent and temperature and identify the value of density, ***d***, to use

d) Then calculate: density x 3.14 x the value from (c) x liquid level and write this down

e) Divide the value calculated in (d) by 1,000,000 and this is the agent mass in kilograms.

<u>Example Calculation</u>

An example is given below. The measurements used in the example are displayed in the table below.

c	*d*	*l*
85 cm	1400	61 cm

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(732)-751-9266

c	*d*	*l*
85 cm	1400	61 cm

a) Calculate the radius: circumference divided by 6.28

$$r = c \div 6.28 = 85 \div 6.28$$
$$= 13.5$$

Write down: r = 13.5

b) Multiply the number calculated in step (a) by itself

$$r \times r = 13.5 \times 13.5$$
$$= 182.3$$

Write down: (b) = 182.3

c) Identify the correct value of density to use from table (page 10). For example, a cylinder of FM-200™ at a temperature of 20 °C has ***d*** = 1400

d) Calculate: density x 3.14 x (c) x liquid level

$$d \times 3.14 \times (b) \times l = 1400 \times 3.14 \times 182.3 \times 61$$
$$= 48,884,838$$

Write down: (d) = 48,884,838

e) Divide the number in (d) by 1,000,000

$$(d) \div 1,000,000 = 48,884,838 \div 1,000,000$$
$$= 48.8$$

The mass of agent in the cylinder is <u>48.8 kg</u>. It has been rounded to 3 figures.

<u>Cylinder 2 - from</u>

Measurements needed to calculate the mass of agent:

1. Mass of the full cylinder, ***w*** in kilograms, found by weighing the cylinder that has the agent in it

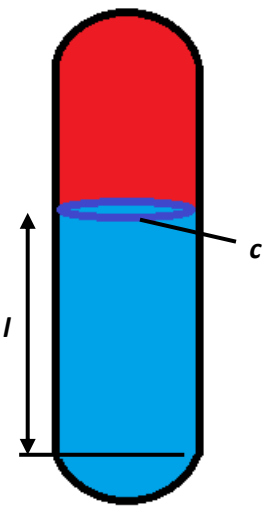

Figure 2.

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2. Mass of the empty cylinder (i.e. when it has no agent in it), ***e***, in kilograms. This is often printed on the side of the cylinder or is available from the manufacturer.
3. Circumference of the cylinder, ***c***, in centimetres. This is the distance all the way around the cylinder.

The overall equation used to calculate the mass is:

$$l = (m \times 1{,}000{,}000) \div (d \times 3.14 \times r^2)$$

The steps below explain how to use this equation

a) Calculate the radius of the cylinder: divide the measured value of circumference, ***c***, by 6.28 and write this down

b) Square the number calculated in (a): multiply it by itself (e.g. (a) x (a)) and write this down

c) Look at table (page 10). Find the correct agent and temperature and identify the value of density, ***d***, to use

d) Calculate the agent mass, ***m***, subtract the empty cylinder mass from the full cylinder mass and write this down.

e) Then calculate: density x 3.14 x the value from (b) and write this down

f) Divide the value in (e) by (f) and write this down

g) Multiply the value in (g) by 1,000,000 and this is the liquid level in centimetres

<u>Example Calculation</u>

An example is given below. The measurements used in the example are displayed in the table below.

c	*d*	*w*	*e*
85 cm	1400	120 kg	70 kg

a) Calculate the radius: circumference divided by 6.28

$$r = c \div 6.28 = 85 \div 6.28$$
$$= 13.5$$

Write down: r = 13.5

b) Multiply the number calculated in step (a) by itself

$$r \times r = 13.5 \times 13.5$$
$$= 182.5$$

Write down: (b) = 182.5

c) Identify the correct value of density to use from table (page 10). For example, a cylinder of FM-200™ at a temperature of 68°F has ***d*** = 1400

d) Calculate the agent mass, ***m***: full cylinder mass – empty cylinder mass

$$m = w - e = 120 - 70$$
$$= 50$$

Write down (d) = 50

e) Calculate: density x 3.14 x (b)

$$d \times 3.14 \times (b) = 1400 \times 3.14 \times 182.5$$
$$= 802,270$$

Write down (e) = 802,270

f) Calculate (d) ÷ (e)

$$(d) \div (e) = 50 \div 802,270$$
$$= 0.0000623232$$

Write down (g) = 0.0000623232

g) Calculate (f) x 1,000,000

$$(f) \times 1,000,000 = 0.0000623232 \times 1,000,000$$
$$= 62.3$$

The liquid level of agent in the cylinder is 62.3 cm. It has been rounded to 3 figures.

Appendix 1 : Table of Liquid Agent Densities

Table 1: Liquid Densities for different agents

All the densities quoted here are quoted to three significant figures only.

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Agent	Temperature (^{o}F)	Density, ρ_l (kg m^{-3})
CO_2	41	896
	50	861
	59	821
	68	773
	77	710
FM-200™	41	1470
	50	1450
	59	1430
	68	1400
	77	1381
	95	1335
NOVEC 1230™	41	1660
	50	1645
	59	1630
	68	1615
	77	1600
	95	1570

VOX
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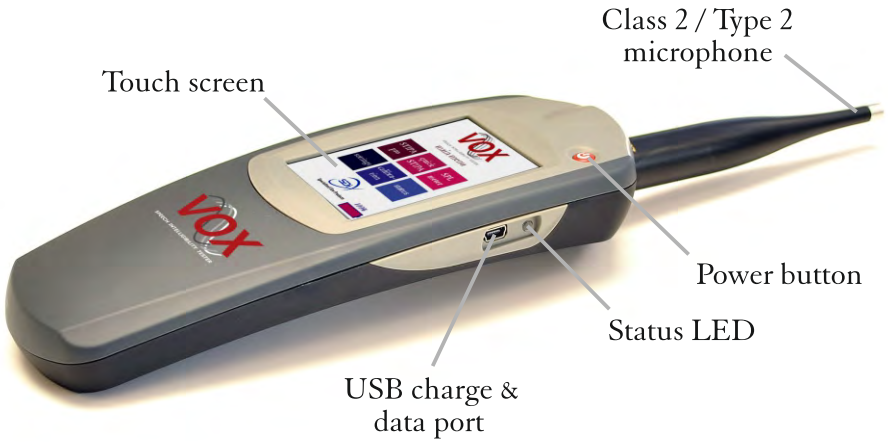
Speech Transmission Index meter and Sound Pressure Level meter
IEC 60268-16 rev. 4, IEC 61672 class 2, ANSI S1.4 type 2

CE

Quick start guide



VOX-01 components

The VOX-01 ships with the following components bundled together in its carrying case:

- The VOX-01 instrument itself
- A Type 2 / Class 2 measurement microphone with integrated pre-amplifier
- USB charger
- USB charger international adapters (US, EU, UK, AU)
- USB cable for charging and data transfer
- Carrying cord (lanyard)
- Spherical foam windscreen
- Flashdrive with test signals and the complete VOX-01 manual
- Calibration certificate

This quick start guide only gives some essential information needed to start working with the VOX-01. The complete manual (included on the USB flashdrive) gives useful additional information to help you get the most out of the VOX-01. The latest update of the manual can also be downloaded from our website: www.sdifire.com

General use and safety precautions

The VOX-01 is a sophisticated measuring instrument that should be used, maintained and stored with care:

- Do not expose the VOX-01 or any of its components to liquids or moisture
- Use the supplied carrying cord to protect it from accidentally being dropped
- Do not use in any environment or atmosphere that may contain flammable or explosive materials
- Protect against heat, high temperatures and flames
- Do not leave the device unattended for long periods of time while operating
- Do not recharge the device when it is inside a closed container. Switch off before storage.

The XLR connector on top of the VOX-01 provides 48V phantom power. Connecting equipment or microphones not designed for 48V phantom power to the VOX-01 will result in permanent damage to this equipment and possibly to the VOX-01 itself.

The VOX-01 can be charged and powered through USB. The voltage provided to the USB connector must never exceed 5.5V. Only use the supplied charger, other chargers and PC USB ports may not supply sufficient current for recharging.

The supplied charger is designed for worldwide operation on any AC source (100V-240V). Use with the appropriate adapter for your region. Do not use if wet, cracked or broken.

Preparing your first measurement

Take the following steps to prepare the VOX-01 for your first measurement:

- Attach the carrying cord
- Connect the measurement microphone to the instrument (XLR connector)
- Press the red power button once to boot the device
- The device takes a few seconds to start up. If the device fails to boot, recharge the battery first (see: “charging and data transfer”)
- The device will now show the main menu:

From the main menu, you can launch apps for the instrument’s different measuring modes, as well as apps that let you calibrate the device and control its settings. All modules make use of an intuitive graphical user interface utilizing the VOX-01’s color touch screen. This gives all modules a consistent look and feel, which will allow you to familiarize yourself with the device with ease.
A button that takes you straight back to the main menu is found at the display’s top right corner in all modules.

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Acoustic measurements

The microphone supplied with the VOX-01 is an omnidirectional microphone complying with Class 2 / Type 2 requirements. The VOX-01 can also be used with other 48V phantom powered microphones, but when connecting a different microphone, always consult the VOX-01 manual for guidance on required checks and calibration.

The VOX-01 is designed to be an extremely flexible acoustic measuring instrument. Its electronics and digital processing capabilities allow the VOX-01 to be used for virtually all types of acoustic measurements, including Sound Pressure Level and Speech Transmission Index measurements. Please consult the complete manual supplied digitally to find out which acoustic measurements your VOX-01 currently supports. This depends on your firmware version; firmware updates (which may include extensions of the VOX-01's capabilities) are downloadable at www.sdifire.com

We recommend that you take the following precautions during any kind of acoustic measurement:

- If you are working in a high-noise environment, make sure to use earplugs or earmuffs.
- While measuring, point the VOX-01 (and in particular its microphone) away from large objects, and away from your own body. It may be convenient to mount the VOX-01 on a tripod.
- Use the supplied foam windscreen when measuring outdoors. If you intend to measure in very windy environments, consider purchasing a larger windscreen.

The Speech Transmission Index

The VOX-01 offers two different modules for measuring the Speech Transmission Index: "STIPA pro" and "Quick STIPA." Both modules make use of the STIPA test signal and the corresponding analysis algorithm. While "STIPA pro" offers access to intermediate measurement results and several advanced features, "Quick STIPA" is perfect for easily carrying out straightforward measurements.

The Speech Transmission Index method is a powerful tool for determining the level of speech intelligibility offered by transmission channels, such as PA systems, large rooms and halls, and telecommunications systems. Next to the STI itself, which is a number between 0 and 1 corresponding to the range between 0 and 100% intelligibility, the STIPA tools on the VOX-01 also provide a wealth of diagnostic information. Description of the STI method and STIPA measuring is beyond the scope of this guide, but in brief, each STI measurement involves the following steps:

- Make sure that the STIPA test signal is being played back through the channel under test. The STIPA signal is found on the supplied USB flashdrive in .WAV and/or .MP3 format.
- While the signal is playing, position the VOX-01 at a representative listener location and press "start." Each measurement runs for 25 seconds. During the measurement, the estimated STI is already shown.
- We recommend doing multiple measurements, at different locations. Data can be stored using the "save" button and retrieved through USB for further analysis and for reporting

Charging, data transfer & updates

The VOX-01 features an internal rechargeable high-capacity battery. The battery will typically last for 5 to 8 hours of continuous use, depending on the device settings. A full recharge cycle takes 3 to 4 hours. Recharging takes place through the USB connector, making use of the supplied charger and USB cable. The charge cycle has finished when the charge status LED burns green continuously.

Always use the supplied USB charger and USB cable for recharging your VOX-01. USB ports on PC's and Macs can be used to power the VOX-01, but the available current is usually insufficient to simultaneously charge the battery. If you need to use another charger than the one supplied with the VOX-01, then make sure that it is cable of delivering at least 1500 mA of charge current.

The USB port is also used for data transfer between the VOX-01 and your computer. If you connect the VOX-01 to a computer, a dialog window will appear on the VOX-01 asking you whether you want to start data transfer with the PC. If you choose to exchange data, then the VOX-01 can not be accessed through its display anymore. If you continue without data exchange, then the device remains operational and is powered through USB.
The VOX-01 presents itself to computers as a "mass storage device," similar to flash drives and external hard drives. You can retrieve data from stored measurements by simply copying them from the VOX-01's internal storage. Firmware updates can also be installed, by copying update packages to the designated location on the VOX-01's file system. Please refer to the full manual for details.

Factory calibration and warranty

Your VOX-01 was thoroughly inspected and calibrated before leaving the factory. The calibration certificate is included with your instrument. As any acoustic measuring instrument, the VOX-01 needs to be factory-recalibrated periodically. Our recommended maximum calibration interval is 2 years.

If the instrument "hangs," becomes unresponsive or generates error messages, try keeping the red power button pressed for 10 seconds. This forces the device to power down, after which you can completely restart the device. If the problem persists, contact the manufacturer.

The VOX-01 is covered through the manufacturer's worldwide warranty programme for 24 months from the date of purchase. This warranty programme covers all defects, except for those resulting from accidents, misuse (including improper electrical connections) and improper maintenance. Explicitly excluded from warranty are signs of normal wear and tear, scratches on the LCD screen, cracks from falling or dropping, damage resulting from improper electrical connections and water damage.

Please direct your warranty claims to:
SDi,
3535 Route 66, Building 6,
Neptune, NJ 07753
Tel: 732-751-9266 Fax: 732-751-9241
Email: Sales@sdifire.com Web: www.sdifire.com

Contains NiMH batteries.
Remove battery pack before disposing of this device.

Quick start guide version 1.1

IEC 60268-16 rev. 4

IEC 61672 Class 2 / ANSI S1.4 Type 2

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VOX

SPEECH INTELLIGIBILITY TESTER

Operating manual

VOX-01

Contact information and support

The VOX-01 is designed and manufactured in the Netherlands and supplied by SDi, USA.

You can contact SDi at the following address:

SDi,
3535 Route 66, Building 6
Neptune, NJ 07753
Tel: 732-751-9266
Fax: 732-751-9241
Email: sales@sdifire.com
Web: www.sdifire.com

Updates of the system's firmware and documentation are released online :

www.sdifire.com/support/#productsoftwareupdates

NOTE: Screenshots and product pictures shown in this manual correspond to the VOX-01 hardware platform 1.8 running firmware version 1.8. Once you update the firmware, the screenshots may not fully correspond to what is being displayed on your device's screen.

See page 46 for new features added in V2.0

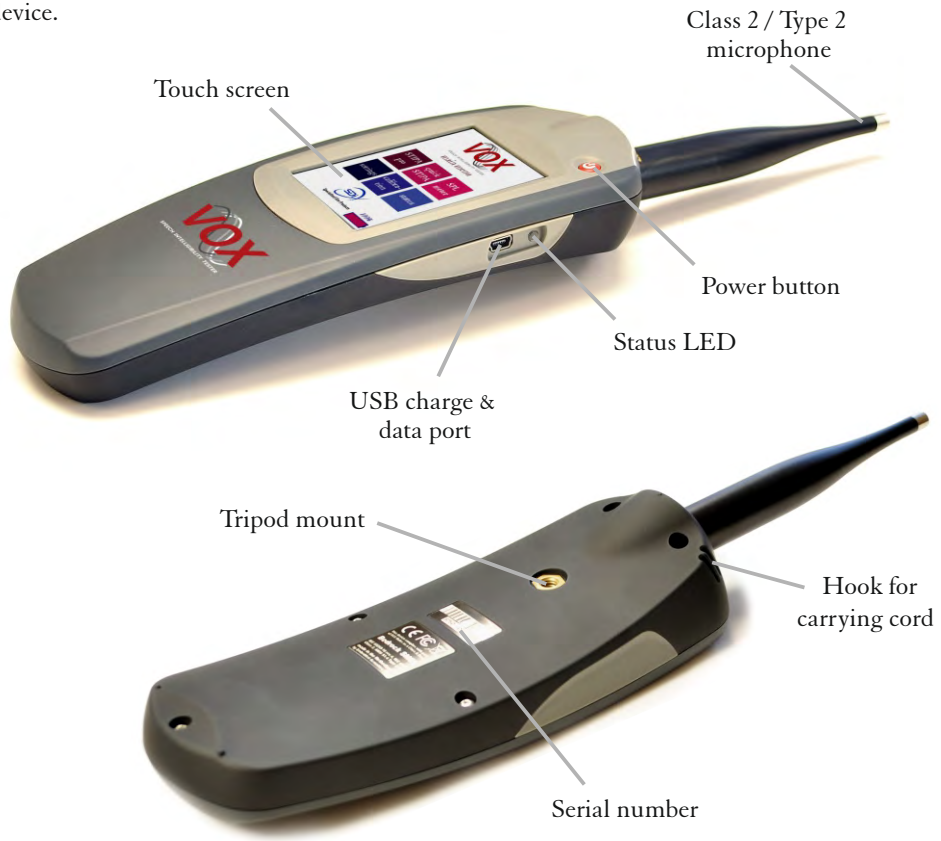
Document version 2.0, release date October 2017. Applies to model(s): VOX-01.

Contents

1. Introduction

Congratulations on purchasing the VOX-01 STIPA meter, the most advanced instrument for measuring the Speech Transmission Index ever built, designed and manufactured by the inventors of STIPA. The VOX-01 is also a fully compliant Class 2 / Type 2 Sound Pressure Level meter, a 1/1 and 1/3 octave Real-Time Analyzer, a Fast Fourier Transform Analyzer, a Reverberation Time Meter, an Oscilloscope, and much more. Its wide range of measurement options cater to a variety of different acoustic measuring needs.

Using the VOX-01 is quite easy, thanks to its touch-screen operation and intuitive menu structure. Most users will get the hang of doing measurements with the VOX-01 without spending much time with this manual. Nonetheless, we strongly recommend that you do read through this manual before starting to use your VOX-01, in order to get acquainted with the various features of the device and the procedures for charging and maintaining your device.



2. General use and safety precautions

The VOX-01 is a sophisticated electronic measuring instrument that should be used, maintained and stored with care:

- We recommend that you always use a lanyard to secure your device against dropping, by suspending it around your neck or wrist. If you use a tripod to mount the device during measurements, we recommend that you use a sturdy model with a sufficiently wide base.
- Do not expose the device itself, the measuring microphone or charger to rain, moisture or liquids of any kind. Take special care to prevent liquids to permeate into the device through the connectors or along the display bezel.
- Do not operate at ambient temperatures over 35°C/95°F
- Do not use close to flames or open fire.
- Do not use in environments where flammable or explosive materials are used.
- Do not keep the device powered on while unattended for prolonged periods of time.
- During transportation and storage, keep the device in a suitable casing or container – preferably its original case. The device needs to be protected from shocks and vibration (due to transportation or falling), excessive temperatures, liquids and moisture, and any other external conditions that could do damage to the device. Care should be taken that other objects cannot come into direct contact with the display during transportation.
- Make sure that the device is switched off before transportation and storage.

Safety precautions when charging

The VOX-01 is a battery-powered rechargeable device, with an internal low self-discharge NiMH battery pack. This battery pack is designed for many years of operation, and therefore cannot be swapped out by the user. Recharging takes place through the mini USB connector found on the left side of the device.

The VOX-01 is charged through the USB connector using high currents of up to 1500 mA. While being charged, the device will heat up. DO NOT CHARGE THE DEVICE WHILE IT IS INSIDE A CLOSED CONTAINER (BOX, BRIEFCASE, ETC.). Please make sure that the device can shed excess heat while charging.

The supplied charger includes adapters for use worldwide, and operates on a wide AC-voltage range of 100 – 240V. Do not use the charger if the casing appears cracked or broken, or if it has been exposed to fluids or moisture. Contact with components inside the charger while this is plugged in may result in serious injury or death.

Safety precautions related to connectors

The VOX-01 features a USB connector and an XLR connector (to which the microphone is attached). If you connect external devices to these connectors, please ensure that these connections are protected against over-voltage and power surges. The voltage supplied to the USB port should not exceed 5.5V. As the USB power circuitry is connected to the battery pack, excessive voltage applied to the USB port may cause the battery pack to catch fire or explode.

The XLR connector supplies 48V phantom power to the microphone. This phantom voltage can be switched on and off through the hardware settings menu. IMPORTANT: connecting equipment not designed for 48V phantom power to the VOX-01 connector (with phantom power switched on) will permanently damage the connected device. The manufacturer explicitly denounces responsibility for any damages to third-party hardware resulting from exposure to the VOX-01's phantom power.

3. Getting started

You should receive your VOX-01 with sufficiently charged batteries to start the device and get acquainted with its features. We do recommend that you fully charge the device using the supplied charger before starting your first real measurement session.

The device is powered on by pressing the red power button once.

Note: the power button can also be used to power the device off. If you press the button while the device is in operation, you will see a dialog window asking confirmation before powering off. If the power button is kept pressed for 10 seconds in the "power on" state, the device will be forced into the "off" condition. This can be used to reset the device if it becomes unresponsive (keep pressed to 10 seconds to switch off, then press again to restart).

The VOX-01 will boot into the main menu. You can launch its different modules from this menu.

STIPA pro: module that gives you access to all STI measurement details
Quick STIPA: simple module to quickly do STIPA measurements
SPL meter: Sound Pressure Level meter module
Settings: change the system's hardware configuration
Calibration: calibrate the VOX-01 and its microphone
Status: general information on the measurement system

All modules will be explained in detail in the following sections of this manual. Apart from these modules, the VOX-01 has two specific operating modes: charging via USB, and data transfer via USB. These modes will also be explained further on in this manual.

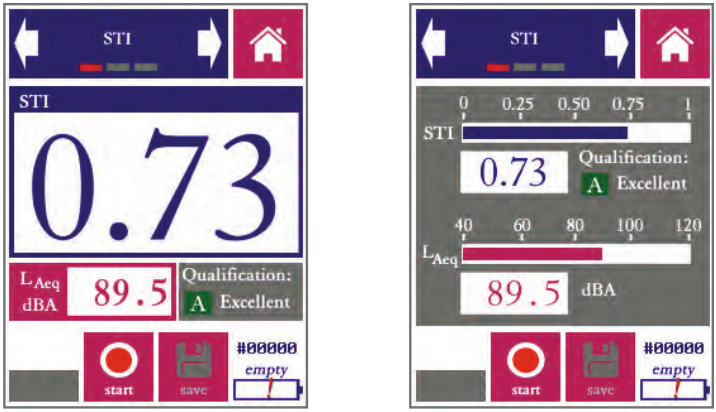
4. Using the VOX-01

Quick STIPA

The Quick STIPA module is intended to do simple and straightforward STI measurements using the STIPA test signal. A comprehensive explanation of the STI method is beyond the scope of this device manual; there are several online and offline resources that provide guidance and information on doing STI measurements. In this manual, we will briefly explain how to set up your equipment for measuring the STI. The Quick STIPA module makes the process as simple as possible.

For any STI measurement, you need a source of the STIPA test signal as well as an STI analyzer. In your case, the analyzer is your VOX-01. What the signal source is, depends on what kind of measurement you aim to carry out.

The Embedded Acoustics reference STIPA test signal is included with the VOX-01 (on a USB flash drive) and can also be downloaded from the SDi website, free of charge. This is a fully IEC-60268-16 rev.4 compliant test signal, compatible with all STIPA meters that conform with the standard.



STI measurement screen of the Quick STIPA module, in digit mode (left) and bar mode (right)

In order to carry out an STI measurement, complete the following steps:

- Power on your VOX-01 and go to Quick STIPA
- Now start playback of the STIPA test signal through the channel or system which you intend to test. Note that the STI that you will now measure, will characterize all parts of your transmission path, from playback device up to the microphone of your VOX-01.

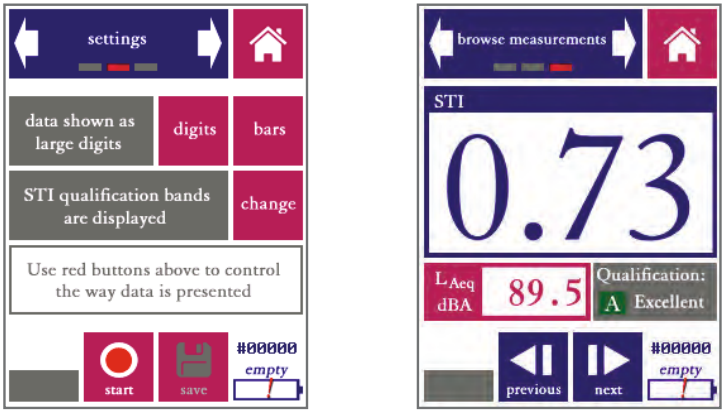
- Tap “Start” on the VOX-01
- Wait for 25 seconds while the measurement takes place. Make sure that signal playback is not interrupted, and that the acoustic environment is stable and free from impulsive sounds (such as door slams).
- You will see that the STI on your screen stabilizing towards its end value.
- Optionally, you can press “save” once the measurement is finished to store the data, to be browsed or downloaded to PC later. A measurement number is assigned to each saved measurement. This number is displayed at the bottom right of the screen (preceded by a “#” character), above the battery indicator.

That is really the entire procedure. If you are new to STIPA measurements, please consult tutorials and standards to make informed decisions about the STIPA signal playback level, measuring positions, number of repeated measurements, etc.

The Quick STIPA module also shows some additional measurement information:

- The A-weighted sound pressure level
- The qualification band (a letter between A and U) that is used in some standards and defined in IEC 60268-16 rev. 4.
- A label (“bad”-”excellent”) the characterizes intelligibility based on the STI

The arrows in the blue bar on the top of the display van be used to navigate through the different screens for each module. The Quick STIPA app has three screens: “STI”, “settings”, and “browse measurements”.



“Settings” screen and “browse measurements” screen. The latter screen is nearly identical to the STI measurement screen, but with previous/back buttons instead of start/stop and save buttons.

The “settings” screen give you some options to control the appearance of your measure ment results:

- Choose between presentation of the STI in large digits or as a bar plot
- Choose whether or not you want to see the qualification bands displayed

The “browse measurements” screen allows you to review earlier (saved) measurements without having to download your data to a PC first.

- Use to blue buttons at the bottom of the screen to scroll back and forth through your saved measurements.
- Note that the measurement number displayed above the battery indicator corresponds to the measurement currently shown on the screen.

Interpreting larger numbers of STIPA measurements by using the “browse measurements” screen will be inefficient; we recommend downloading the data to a PC for this.

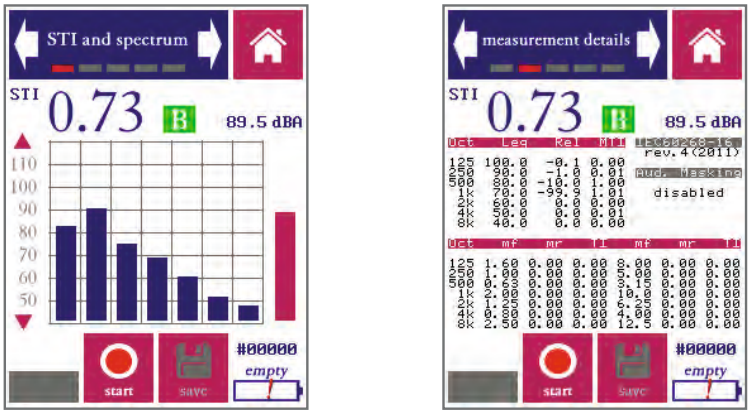
Please take note of the following features of the Quick STIPA module:

- On the bottom left of the screen, a red “recording dot” is displayed whenever a measurement is running. Below this red dot, the progress of the current measurement is indicated by a progress bar.
- The “save” button is only operational when new (unsaved) measurement data is available from a finished measurement. If this is not the case, the save icon is colored gray.
- The VOX-01 calculates a heuristic reliability metric for each STI measure ment. If the measurement is found to be unreliable (e.g. due to disturbance by impulsive sounds), then a red cross is displayed across the STI value. Crossed-out STI values are often seen at the beginning of measurements, when the calculation has not ran long enough to compute a reliable STI. As soon as the cross disappears, the STI value can be trusted to be within the usual STI measurement error of 0.03.

A crossed-out STI value means that the measurement is not (yet) sufficiently reliable

STIPA pro

The STIPA pro module is also used to measure the Speech Transmission Index, but unlike the quick STIPA module, it also comprises features that allow you to analyze and manipulate your measurement data in greater detail.



"STI and spectrum" and "measurement details" screen in the STIPA pro module

The STIPA pro module has five screens:

STI and spectrum: display measured STI, octave spectrum and dBA level
Measurement details: display all measurement details including the MTF
Settings: configure the STIPA pro module
Additive noise: enter and enable/disable a noise spectrum to add to data
Browse measurements: review saved measurements

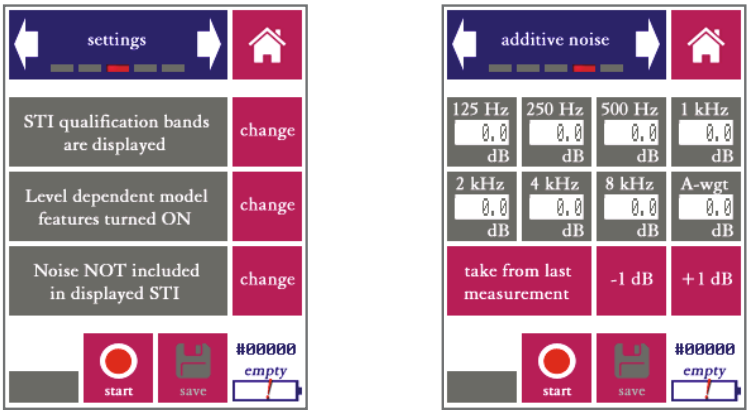
Measurements are usually started from the "STI and spectrum" or the "measurement details" screen. STI measurements are set up and started in the same way as when using the Quick STIPA module (see above). However, in the STIPA pro module, more details about the measurement are shown, and the user has more elaborate options to configure the measurement. Measurements are started, stopped and saved in the same way as with the Quick STIPA module (by using the buttons at the bottom of the screen).

The "STI and spectrum" screen shows not only the current STI value and the A-weighted sound pressure level, but it also shows an octave band spectrum of the measured signal in the 7 octave bands from 125 Hz to 8 kHz. The STI analysis is carried out in these octave bands. The scale of the octave band spectrum plot can be modified by tapping on the triangualar arrows to the left of the plot.

The “measurement details” screen shows all the diagnostic details of an individual STI measurement:

- OCT: The octave center frequency (Hz)
- REL: The octave band levels relative to the STIPA signal spectrum (this is effectively the frequency transfer function of the tested channel in octaves).
- MTI: Modulation Transfer Index. This quantifies the contribution to the overall STI from each octave band.
- mr: the m-values (modulation transfer function in octave band OCT for modulation frequency mf). These m-values are uncorrected, not adjusted for masking effects and additive noise. Since the STIPA signal features two modulation frequencies per octave band, there are also two m-values per octave band. The modulation frequencies are also shown (mf)
- TI: the Transmission Index per octave band for each modulation frequency

These measurement details will enable more experienced operators to determine not only the speech intelligibility of the tested channel, but also the *causes* of intelligibility reduction induced by the channel.



Settings screen (left) and additive noise screen (right)

The settings screen gives the user three options:

- Choose whether or not to display STI qualification bands (A-U) as standardized in IEC-60268-16. These bands are used in certain applications.
- Choose to enable or disable the level dependent model features: level dependent masking and the speech reception threshold. *For standard measure ments, these features should be turned ON.* Only when all-electric transmission chains are tested (without any acoustics involved) should these features be turned off, since there is no acoustic level reference in those cases.
- Choose whether or not to (computationally) add noise to the measurement.

There are two ways to include the influence of background noise in your STI measurement:

- Simply do your measurement in the actual noise environment. The STI method is designed to incorporate the effects of any noise present during the measurement representatively in the measured STI. This approach works well if the noise field is stable and free from fluctuating and impulsive-components.
- If you have the option to physically “turn the noise off,” then it is often more accurate to add the noise computationally in a so-called post-hoc calculation The VOX-01 does this for you, if you enter the noise spectrum in the “additive noise” screen and change the setting to “Noise included in displayed STI

If you wish to add noise computationally, the screen “additive noise” should be used to enter the noise spectrum. Note that the noise spectrum that you enter is only used if you also select the corresponding option in the settings menu.

You can browse through all measurements saved earlier in the “browse measurements” screen.

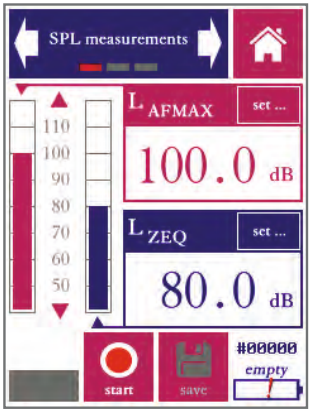
The following tips and pointers may be useful to remember when browsing STI measurements with Quick STIPA and STIPA Pro:

- Measurements saved in Quick STIPA can be browsed in STIPA pro, and vice versa. The measurement numbering range is shared between these modules. This means that you can use STIPA pro to investigate measurements done with Quick STIPA in more detail using the browsing screen in STIPA pro.
- The settings you choose in STIPA pro (additive noise, level dependent masking) affect the current measurement, but also affect which data is shown in the measurement browser. This means that you can always enter a noise spectrum and see how this affects measurements you did earlier on. Similarly, you can go back later on and see what affect level dependent masking has for a certain measurement.
- This implies that all data for each measurement is always saved - including any data not actually shown during the measurement itself.
- Measurements can also be retrieved over USB; please refer to the section “accessing saved measurements on a PC” for further instructions. For larger numbers of measurements, processing of these saved data files (e.g. through worksheet software) may be more efficient than inspection through the measurement browser.

SPL meter

The VOX-01 is also Sound Pressure Level meter (also known as SPL meter or SLM) that complies with IEC 61672 Class 2 and ANSI S1.4 Type 2. In fact, the VOX-01 electronics far exceed the requirements for a Class 2/Type 2 device.

The layout and buttons of the SPL meter app are similar to the STIPA module, featuring three screens: SPL measurements, settings and browse measurements.



SPL measurements screen

The following sound pressure level measurement settings are supported:

- Time weighting: Fast (F) and Slow (F)
- Frequency weighting: Z (linear, unweighted), A-weighted, C-weighted
- Max hold (holds and displays the maximum level during the measurement interval; used with either Fast or Slow time weighting)
- Equivalent continuous (EQ): computes the time-integrated level over the measurement interval; the level shown corresponds to the level of a contin -uous signal containing the same amount of energy as the measured signal.
- Peak values (PK): the highest instantaneous value within a measurement interval.

Once a measurement has started, each combination of the above settings is measured simultaneously. However, not all of these combinations are displayed: only two level measurements are displayed at the same time.

Each of these two levels is shown in its own bar graph and its own digit field. The red graph corresponds to the red field, the blue bar graph to the blue field. You are free to select which level to display in each of the two fields. Tap the “set” button in the level field to choose time weighting, frequency weighting, max hold and time integration settings for the corresponding field.

The settings screen in the SPL module allows you to set the measurement time. Once you press start, the measurement will run for as many seconds as you choose here. You may also choose to let measurements run continuously; you then determine the measurement time manually, by choosing the moment you press "stop."

The SPL meter module also features are measurement browser, that lets you review previously saved sound pressure level measurements.

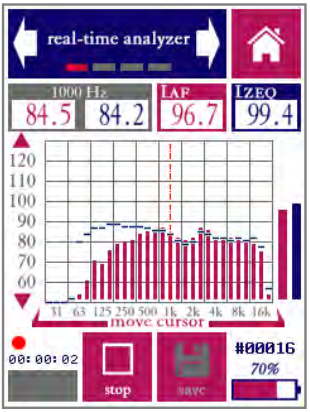
A few things to note about SPL measurements and the SPL meter module:

- By definition, "max hold", "EQ" and "PK" are mutually exclusive settings.
- The elapsed measurement time is shown above the progress bar. If the measurement interval is set to "continuous," the measurement will run until it is manually stopped. Note that, in practice, the maximum measuring time is limited by:
    - The battery. When measuring continuously, the battery is drained relatively quickly (within 3-4). For longer measurements, we recommend using the charger or an external power bank.
    - Internal data storage, especially if you are recording all measurement audio (per the option in the "Settings" module). When recording audio, the internal storage fills up in about 5 hours.
- When you press "save," data from the current measurement is stored. Results based on all time and frequency weightings are saved; not just the results that are currently displayed. However, as remarked above, since the instantaneous levels fluctuate throughout the measurement, these cannot be saved as a single number representing the entire measurement interval. So for each saved measurement, just the maximum level (max hold) and equivalent continuous level (EQ) and Peak level (PK) are saved.
- As a logical consequence, the measurement browser can only display Max Hold, EQ and PK results from earlier measurements. If you set a display field to show instantaneous values, the measurement browser will leave this display field blank.
- You can use the measurement browser to go back to earlier measurements, and see what the level is with different time- and frequency weightings applied.
- The measurement numbers form a separate consecutive series for each module. That means that the same measurement number might occur multiple times (once for each module; e.g. number #0002 might exist for SPL as well as RTA, STIPA, etc.)

Real-Time Analyzer (RTA)

The RTA module has two main modes of operation: as a 1/1 octave band analyzer (spanning the octave bands from 31 Hz to 16 kHz) and as a 1/3 octave band analyzer (25 Hz through 20 kHz).

The operation is generally similar to the SPL module, but instead of just the overall signal level, a frequency analysis (into 1/1 or 1/3 octave bands) is also shown.



RTA main measurement screen (1/3 octave band mode)

The RTA module has the ability to present two different spectral views at the same time, differing in frequency weighting (A, C or Z) and time averaging and integration (FAST, SLOW, MAX, or EQ). The main spectrum is presented in red bars, while a second (auxiliary) spectrum is shown in blue lines. The corresponding broadband levels are also shown, to the right of the spectrum.

While the spectrum graph already gives a first impression of the spectral content of the measured signal, you may wish to read the exact value in each band. This is done by placing the cursor (dashed line) over the band of interest. The cursor can be moved left and right by pressing on the left or right side of the frequency axis (or the area of the graph above the axis). The values for the selected band are shown in the grey field on the top left of the screen (main weighting shown in read, aux weighting in blue - same color as the spectrum bars).

The “measuring time” screen can be used to set the duration of a measurement to a fixed value. The measurement can also be set to run until stopped manually. The “settings” screen allows you to switch between 1/1 and 1/3 octave band resolution, and to change the weightings for the main and auxiliary spectrum views.

By pressing the “save” () button in the main measurement screen, you store the current measurement on the devices internal storage, using the measurement number indicated above the battery indicator.

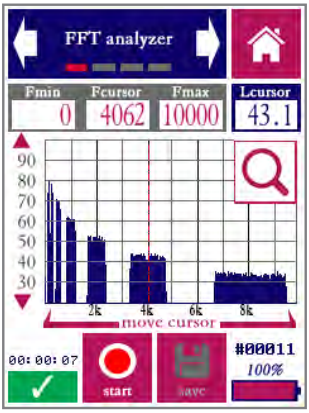
Some remarks about the RTA module:

- By definition, “max hold” and “EQ” are mutually exclusive settings.
- The elapsed measurement time is shown above the progress bar. If the measurement interval is set to “continuous,” the measurement will run until it is manually stopped. The progress bar itself is not used when measuring continuously.
- Measurements saved as 1/1 octave cannot be retrieved as 1/3 or vice versa. However, data recalled through the measurement browser are shown with the frequency weightings selected at the time the measurement is recalled - even if these are different from the settings that were in effect during the measurement. This allows you to inspect the effect of frequency weightings on all measurements saved previously
- Note that the spectrum and its corresponding broadband level are affected by the same time- and frequency weightings. In other words, if the main spectrum is A-weighted, then the level shown in the red field is also A-weighed (and vice versa). If you wish to display a Z-weighted spectrum and an A-weighted level at the same time, you need to display these in different channels (main and aux).
- The measurement numbers form a separate consecutive series for each module. That means that the same measurement number might occur multiple times (once for each module; e.g. number #0002 might exist for SPL as well as RTA, STIPA, etc.)

Fast Fourier Transform Analyzer FFT

The FFT module allows you to perform spectral analyses with a much higher frequency resolution that the RTA module. This is very useful if you are looking to identify the exact frequency and level of certain signal components, or if you want to study the harmonic structure of sounds.

The maximum frequency resolution of the FFT analysis, with supported window sizes of up to 32768 samples, approaches 1 Hz. This means that the analysis contains more data and more detail than can be shown on the display at once. In order to deal with this, the FFT module features a zoom function to zoom in on part of the spectrum. Also, the full details of every measurement can be retrieved through USB by saving measurements.



FFT measurement screen

The general "look and feel" of the measurement screen is similar to the RTA module, but with a few differences. First of all, in line with the normal conventions, frequency weightings are not supported by the FFT module. Secondly, a button at the top right-hand side of the graph can be tapped to reveal a small keyboard with zooming options:

These controls are used to zoom in or zoom out along the frequency axis, and to center the display around the current cursor position. By pressing "hide" the zoom controls are collapsed again. The zoom controls are used together with the cursor to focus on any region of interest in the spectrum.. The cursor, shown as a vertical red line, can be moved by tapping the arrows below the frequency axis or by tapping directly on the graph.

The minimum and maximum frequency that can currently be displayed are indicated at the top of the screen, as well as the exact frequency at the cursor position and the level at the cursor position.

The second screen of the FFT module allows you to set an integration time for the FFT analysis. If the integration time is set to "infinite," then the instantaneous spectrum is shown. The graph on the display will show rapid fluctuations. In general, the longer the integration time that is chosen, the more accurate the spectrum.

The third screen of the FFT module ("settings") is where the parameters of the FFT algorithm are controlled.

The window size determines the frequency resolution of the FFT analysis. The number of spectral lines is exactly half the window size. At the maximum window size (32768), the audible frequency range is analyzed in16384 spectral lines. Shorter windows offer less detail, but the analysis runs quicker allowing for shorter integration times to arrive at the same accuracy.

The type of window to be applied can also be set in the graphics screen. Each type of window (blackman, hamming, rectangular, etc) is associated with a specific set of advantages and disadvantages relating to the FFT analysis. We recommend studying the literature on spectral analysis, or one of the many available online resources, to choose the window that best suits your application.

For most non-critical applications, the settings selected by default (hamming window with a window size of 8192 samples) are a suitable choice.

Some remarks about the FFT module:

- The elapsed measurement time is shown above the progress bar. If the integration time is set to "continuous," the instantaneous spectrum will be shown.
- The FFT module is recommended whenever a high frequency resolution is needed. To obtain standardized spectral measurements, where the exact levels at standardized frequencies are of prime interest, 1/3 or 1/1 octave band measurements through the RTA module are the best choice.
- Saved data can be retrieved over USB and imported in MS Excel or any other program capable of dealing with .csv formatted data. This is the same as all other modules. However, the FFT module is capable of producing much more data (up to 32768 data points and frequencies for a single measurement). Not all spreadsheet programs may be able to import that many columns, which is why the data is organized in rows rather than columns.

Reverberation Time Meter (RT60) RT60

The reverberation time (or RT60) is among the most commonly specified acoustic measures. Unfortunately, reverberation time measurements are also among the most complex to carry out accurately. RT60 measurements are prone to errors, which cannot always be detected by the measuring device.

If you are new to measuring reverberation times, we recommend that you read this section of the manual carefully, and preferably also consult external literature and training materials on reverberation time measurements.

Standardized procedures for measuring the reverberation time of a room are specified in ISO-3382-2. Generally speaking, there are two different ways to measure RT60: the impulse response method and the interrupted noise method. Both methods are standardized through ISO-3382-2.

The impulse response method uses a carefully controlled, known test stimulus of short duration (sweeps, chirps, pseudo-noise sequences or gunshot-like impulsive sounds). By normalizing the recorded sound in a room relative to the source signal, the impulse response of the room is obtained. From this impulse response, the RT60 is calculated. The impulse response method is currently not supported by the VOX-01. Of the two available methods, it is more likely to produce invalid results for the following reasons:

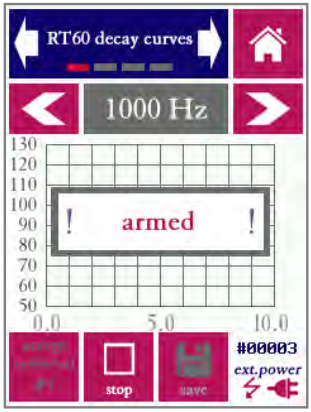
- The impulse response method requires that very specific, known test signals are used. Any difference between the test signal that was really used on the one hand, and that test signal that the measuring instrument expects on the other hand, may produce greatly distorted results.
- Depending on the type of test signal, even the slightest movement of the microphone during the test may render the measurement inaccurate. The use of a tripod is absolutely necessary.

The interrupted noise method, as supported by the VOX-01, measures the decay of the sound field if a sound source is suddenly switched off. This method is more robust against slight inaccuracies or inconsistencies in the placement of sound source and microphone. In small rooms, no other tools than the VOXBOX talkbox and the VOX-01 may be needed. In larger rooms, a larger (spherical) loudspeaker and amplifier will be needed. Either way, the procedure requires the following steps to be taken in preparation:

- Place a source of continuous sound (preferably pink noise) in the room for which the RT60 needs to be measured.
- Place the VOX-01 at some distance from the source (stay clear from walls and other flat surfaces)

- Start the RT60 module and press “arm”
- To trigger the measurement, shut off the noise source.

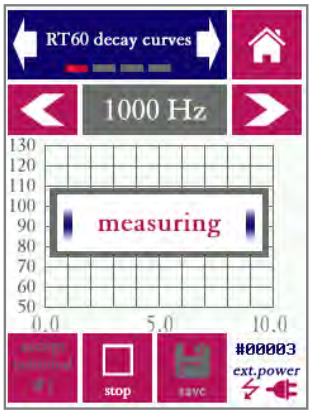
Once the device has been armed, it will start measuring the ambient noise field. At this stage the device is continuously sampling the audio, but the RT60 measurement itself has not yet been started. The device is merely detecting the moment the noise source has been shut off - which is the beginning of the energy decay curve.



RT60 measurement screen, armed for measurement, but before a measurement has started

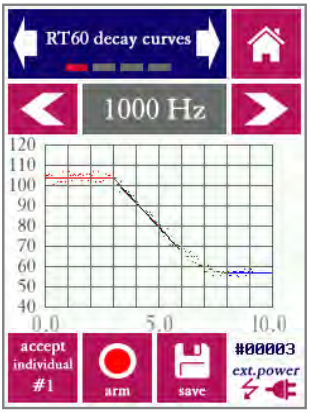
Make sure that the external sound source is always switched on BEFORE you arm the VOX-01 for a measurement by pressing “arm”

Once the beginning of the energy decay curve has been detected, the device starts measuring. By definition, no RT60 results can be calculated until the measurement and analysis are completely finished. While the device is acquiring measuring data, the following screen is displayed:



RT60 measurement screen, while the measurement is running and data is being acquired

Once the measurement is completed, the energy decay curves are plotted. Use the arrows to cycle through the frequency bands (note that you can choose whether to measure in 1/1 or 1/3 octave bands through the “settings” screen).



RT60 decay curves plotted once the measurement is completed

Inspect the decay curves to visually verify that the measurement is correct. An incorrect measurement (which should be rejected) may become apparent in any of the following ways:

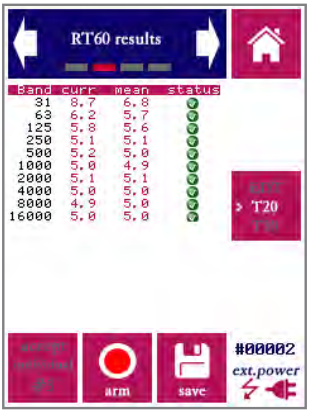
- The plotted data points do not reflect the expected linear decay of energy: the level does not decrease linearly over time. If this happens, the triggering process may have been disrupted.
- The linear decay curve that is fitted (drawn line) does not match the displayed data points. E.g., the starting point of the decay curve may be off.
- The signal-to-noise ratio (difference between the steady-state noise signal and the system noise floor) is insufficient.

From the decay curves, three different reverberation time metrics are calculated:

- The EDT (Early Decay Time), based on the first 10 dB of decay
- The T20, based on the section of the decay curve between -5 dB and -25 dB
- The T30, based on the section of the decay curve between -5 dB and -35 dB

Each of these three metrics has its own linear decay curve fit through the data points. The values of the EDT, T20 and T30 can be seen on the second screen of the RT60 module. Note that the reverberation time usually differs significantly between different frequency bands. Also note that (although respectively measured over 10, 20 and 30 dB of decay) the values of EDT, T20 and T30 are always extrapolated to 60 dB of decay; hence the name T60: the time it takes for the energy to decay to a level 60 dB below the starting level.

Cycle through EDT, T20 and T30 using the button on the right. Note that each of these three metrics is always calculated and saved for each measurement, even if only one metric at a time is displayed on the screen at a time.



RT60 measurement results.

Quite often, a single RT60 measurement is insufficient to obtain a stable result. Many application standards require that data from multiple measurements are averaged. Sometimes the position of the noise source and/or measurement microphone must be changed in between measurements.

The averaging of multiple measurements is supported in the following way:

- On the bottom left of the screen you will find an “accept individual” button, which is not usually present in other measurement modules. Use this to commit a measurement to memory, if you are satisfied (upon inspection of the decay curves) that the measurement is valid.
- Once your first (valid) measurement is finished, press “accept individual”
- The letters and the numeral “#1” are now greyed out on the accept button.
- Now repeat the test procedure as many times as required, pressing “accept” after each measurement. The serial number is incremented after each individual measurement.
- Data from up to 20 individual measurements can be kept in the device memory at the same time.
- In the “RT60 measurement details” screen, you can inspect the latest individual measurement as well as the mean across all measurements.
- Once you are satisfied with the overall (mean) results, press the “Save” button (to the right of the “arm” button). Mean data from all measurements are now permanently saved and the temporary memory is reset.
- When browsing through save measurements (in the “browse measurements” screen), you will see the mean data from each measurement series.

The capability of averaging measurement data adds complexity to the user interface, but averaging is sometimes essential to arrive at valid end results. Note that averaging takes place on the level of the individualy measured data points along the decay curve (so not just across individually measured reverberation times).

In the table on the measurement details screen, a column is shown that indicates the status (reliability) of the current average measurement for the corresponding frequency:

- A green checkmark indicates a healthy, reliable measurement. The RT60 measurement data may be presumed accurate with a margin of error of at most 0.1 seconds.
- A yellow exclamation point indicates that the measurement accuracy cannot be guaranteed. This may have various causes. For example, the signal-to-noise ratio may be insufficient (not enough dynamic range between the steady-state noise signal and the noise floor with the noise source switched off). This may also happen if the signal fluctuates more than expected for a given frequency band and the resulting linear decay fit is poor.
- A red cross indicates that the result is statistically deemed unreliable. In order to obtain a reliable result in the corresponding frequency band, averaging across more individual measurements (adding to the overall measurement time) is needed. If the red cross persists upon averaging across multiple measurements, disregard the corresponding frequency band or repeat the entire measurement series.

It is good practice (and a formal requirement for many applications) to average across as many measurements as needed to obtain a green cross next to all relevant frequency bands.

Never rely on results from RT60 measurements until you have checked the reported status per individual frequency band. Note that in some rooms it may be difficult, if not impossible, to obtain reliable results for the lowest frequency bands.

Please take note of the following practical tips and pointers for RT60 measurements:

- Do not place the measurement microphone and noise source too close to each other; if possible, estimate the reverberation radius in the room, and make sure that the microphone is as far outside the speaker's reverberation radius as possible.
- Make sure that your noise source is capable of producing levels far above the ambient noise floor in the room, and above the electronic noise floor of the device. Ambient levels of 90 dB(A) and higher are often needed. The SNR must be at least 50 dB in all relevant frequency bands.

- A spherical loudspeaker configuration playing pink or white noise is the preferred source of measurement noise.
- If you are using a single, non-spherical loudspeaker, avoid placement of the microphone on the loudspeaker axis. Even though the microphone is omnidirectional, avoid pointing the microphone straight at the loudspeaker.
- Eliminate sources of background noise.
- The state of all doors, windows and other separations should be fixed (open or closed) throughout the measurements. The opening of doors and windows changes the reverberation time.
- Do not walk around when the measurement is running, especially not in the immediate surroundings of the noise source.
- The signal-to-noise ratio requirements for RT60 measurements are sometimes difficult to meet. Especially for T30 measurements, it may be necessary to play back the test stimulus (interrupted noise) at high sound pressure levels.
- If your signal-to-noise ratio is insufficient for reliably measuring the higher frequency bands, consider switching over to white noise (instead of the commonly used pink noise) as a source stimulus.

If you are having trouble getting acceptable measurement data (green balls with check marks next to your measurement data), it may help to study the exact reasons why your measurement data is marked for rejection.

Along with each measurement value, the reliabily status is display (acceptable, warning, error). The stored data for each measurement (downloadable via USB) contains more details on the exact motivation for the indicated reliability status. This is indicated with the following letter codes:

- d: no data was present (error)
- r: not enough range (warning)
- b: bandwidth-time product too low (error)
- n: snr too low (warning)
- s: start time before knee point of the decay curve (warning)
- c: correlation of the decay curve fit is low (warning or acceptable, depending on value)

Multiple letter codes may be stored with a single measurement value.

LAEQ Logging

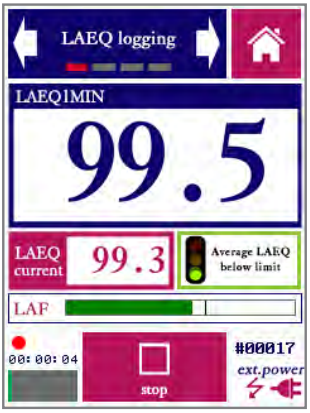
The LAEQ logging module is intended for long-term monitoring and logging applications. When running this module, the VOX-01 keeps track of how the equivalent-continuous A-weighted sound pressure level (LAEQ) develops over time. This is displayed on the device and also logged, for download to a PC later on. This module can be used for several purposes:

- monitoring of environmental noise sources
- monitoring and logging of sound levels at music venues
- measuring sound levels of multiple events across a large time span (e.g. measuring of multiple train passages)

Instantaneous and time-averaged data are shown on the display. If you enter a level limit, a warning ("traffic light") will be displayed to indicate whether the limit is currently being exceeded. The log file is automatically saved, and can be used to demonstrate that (legal) limits were not exceeded.

The LAEQ logging app measures three different metrics:

- The LAEQ during a short time period between 1 and 60s. This is level ("LAEQ current") can be thought of as the current contribution to the overall sound exposure.
- The LAEQ across a longer time span (1-60 minutes), calculated as a movering average of a series over shorter time periods (i.e. a moving average of the series of "LAEQ current" measurements). For example: the average LAEQ across a time span of 15 minutes is indicated as LAEQ15MIN.
- The current instantaneous level with FAST time weighting (LAF). This measure is not logged; it is only displayed as in the form of a bar plot, to obtain a quick impression of how the instantaneous level at any moment is affecting the LAEQ.



The LAEQ module showing the moving average LAEQ across 15 minutes.

The LAEQ logging module has a start/stop button similar to all other modules, but unlike other modules, it has no "save" button. Since this module is specifically intended for logging purposes, all data is always saved to a text file. Whenever a new measurement is started, the measurement number is automatically incremented and a new file is opened. This means that data is never inadvertently discarded (e.g. by forgetting to press save after a lengthy session).

LAEQ logging sessions can run for a long time, up to many hours or even days (when operating on external power. Before starting a long session, always check if there is enough free storage on the device. When recording audio (which is an option available through the settings module), the memory fills up in 3-4 hours. We recommend disabling audio recording on long sessions.

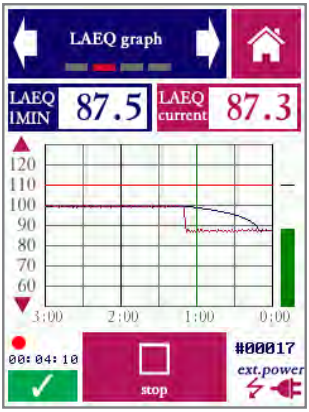
As an example (for the purposes of this manual), we will assume that time averaging takes place over a window of 15 minutes, resulting in LAEQ15MIN (which is a commonly used setting for sound exposure monitoring at music venues). However, note that the averaging time can be adjusted to any period between 1 and 60 minutes.

The LAEQ15MIN as displayed on the screen is the moving average of a series of "LAEQ current" measurements. The shorter the time period used for LAEQ current, the more values are used to compute LAEQ15MIN (and the longer your log file will become, since a line is written for every LAEQ current period). If you choose a short period for LAEQ current then you will be able to determine fluctuations in the measured level more accurately, but you may end up with a lot of data to sort through. There is a trade-off; the optimal choice depends on the application.

"Traffic light" indicating whether the limit is being exceeded.

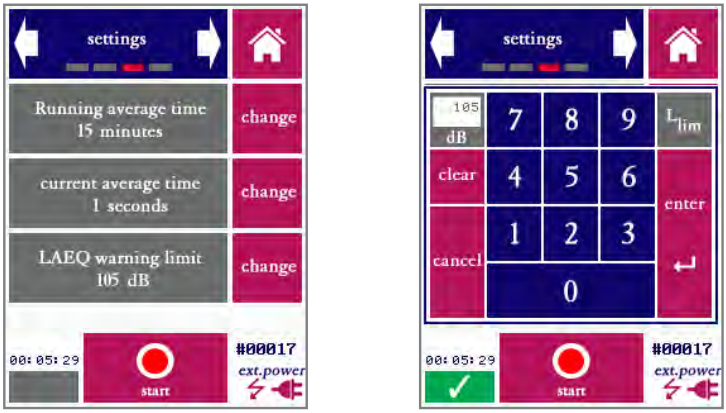
If the LAEQ15MIN exceeds the preset level limit, the traffic light indicator will turn red. If the LAEQ15MIN is still below the limit, but LAEQ current exceeds the limit, this implies that the LAEQ15MIN will eventually reach the limit if the current levels do not go down. In that case, the traffic light will be yellow/orange. If the LAEQ15MIN as well as the current value are below the limit, then the traffic light shows green.

The first screen of the LAEQ monitoring module (see previous page) gives the levels in large digits, and creates a quick overview. The second screen (see next page) shows a graph of the running series of "LAEQ current" measurements, which gives a good feel of how the overall level is developing.



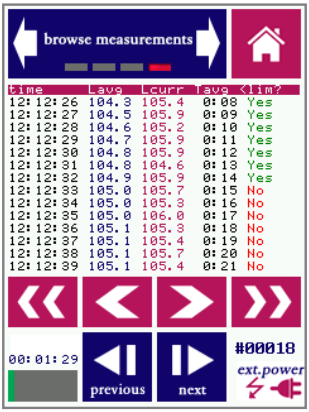
Screen 2 of the LAEQ module, showing a graph of how the average LAEQ is developing.

In cases where the operator has control over the measured sound level (i.e. through control of a PA installation), and is using the VOX-01 to make sure that the level is kept below the limit, the graph gives a useful insight into how much "room" there is below the limit. In cases where noise events (such as train passage) are monitored, the graph shows a recent history of events.



Settings screen; the right picture shows the keyboad that appears when the "change" button is pressed to adjust the warning limit

As with all modules, the LAEQ logging module has a screen which can be used to set all parameters (in this case: LAEQ averaging time (1-60 minutes), current intervals (1-60 seconds) and the level limit. Values are entered through a keyboard that appears upon pressing "Change."



Browsing through measurement data

Browsing through measurement data works a little differently than in other modules, since the amount of data associated with a measurement file can be very large. In many cases, it will not be practical to inspect the data from the device itself, and data will be downloaded to a PC first.

The blue buttons are used to browse through all earlier log files stored on the device. Note that each file may span anywhere between a few seconds and many hours, depending on how much time elapsed until the "stop" button was pressed. Within each file, you can scroll through the data with the red arrow buttons (single arrow to scroll line-by-line, double arrow to quickly scroll page-by-page). Each line shows the time, the current level for the corresponding measurement interval, the average LAEQ and an indication whether or not the limit was exceeded.

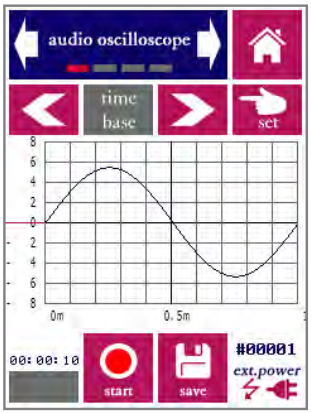
Long sessions may be broken into multiple files by pressing stop and (immediately) again start. If the device crashes unexpectedly (e.g. in case of power failure), there is a chance that (part) of the log file may be lost. By breaking the session up in multiple files, the risk of losing data is reduced.

For long sessions (>3 hours), you will need to power the device from an external power source (such as a PC, power bank or the USB charger).

Note that the log file contains more information than shown on the device. In particular, not just the time but also the date is stored. Make sure that the date and time are set correctly (though the settings module).

Oscilloscope

The oscilloscope module is intended to quickly inspect acoustic signals, in particular periodic signals, in the time domain.



Sine wave with a frequency of 1000Hz as seen through the oscilloscope module

Directly from the first screen of the module (see above), you can control the horizontal scale (time base) and vertical scale of the graph, as well as the trigger mode. Select which setting you want to adjust, and press "set." Then choose the intended setting; by pressing "back" you can go back to reach the other settings again. Under trigger mode, you can set the level and slope (rising/falling). Red lines by the vertical axis indicate the trigger level.

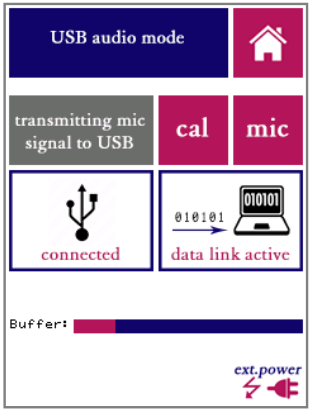
Additional settings can be accessed through separate screens of the oscilloscope module. These include the measuring time, the choice whether or not to apply linear interpolation on the data, enabling or disabling frame averaging, and a choice between acoustic and electric measurements. If you are measuring sounds (with the microphone mounted), choose "acoustic." The amplitude scale will be expressed in the unit Pascal (Pa). If you are measuring without microphone, but directly into the XLR input, select "electric." The vertical scale will be expressed in Volts (V). Similar to any other oscilloscope, the settings for the time based and sensivity are expressed relative to the division lines on the screen (s/div, V/div, Pa/div).

Remember to turn of the 48V phantom power through the settings menu if you intend to do electric measurements. Note that the input impedance of the XLR input is (nominally) 2 kOhms.

The basic operation of the oscilloscope module is similar to the common (hardware) oscilloscopes that many engineers are familiar with. Note that the frequency response of the system is limited to audio frequencies (up to 20 kHz).

USB audio device mode

When starting this module, a special mode of the device is activated, in which it performs no other tasks than simply streaming audio to a PC, applying the VOX-01 level calibration. This is done in the form of a single-channel stream, at a fixed bandwidth of 48 kHz and a bit depth of 32 bits. All current versions of MS Windows should recognize the VOX-01 while operating in this mode as a "USB audio device" and may also indicate that it is an "omnidirectional microphone." Once the device is detected by Windows, make sure that the software that you intend to use is also configured for the device. A small Windows test application is included on the USB flash drive that came bundled with your VOX-01



The VOX-01 display while in USB audio mode

Once the device is connected via USB (and the PC has recognized it as an audio device), an indication showing "USB connected" will appear. Once data starts streaming, an animated picture and the message "data link active" will indicate that data is being transferred. This will happen once an application initiates streaming audio from the VOX-01.

The audio signal is scaled so that full scale corresponds to 150 dB (e.g, a signal with a level of 94 dB will correspond to a level of -56dB relative to full scale). Windows drivers and applications may digitally adjust the level, by applying software-based volume settings. If left unadjusted, the volume of the signal when directly played back on the PC may be quite low. This is done on purpose, so that high levels of up to 150 dB can be accommodated. Given the fact that 32-bit audio has a dynamic range of 192 dB, this does not affect the integrity of even the lowest-level signals. The entire dynamic range of the VOX-01 is available digitally. If the audio is too soft, simply adjust the volume control on the PC.

If you want to explicitly calibrate your windows software to work with the VOX-01, press the "cal" button to generate a synthetic 1000Hz sine at 94.0 dB. If you calibrate your software to this level, then all audio measured by the VOX-01 will be registered at the correct levels in your software as well. Press "mic" to return to normal operation.

Settings

The settings module will allow you to configure the generic settings of the device, in addition to the module-specific settings found in each module. The following attributes can be set:

- Time and date
- Time interval before the backlight automatically switches off to save power
- Phantom power to the microphone
- Microphone pre-amplifier gain
- Calibration of the touch screen digitizer

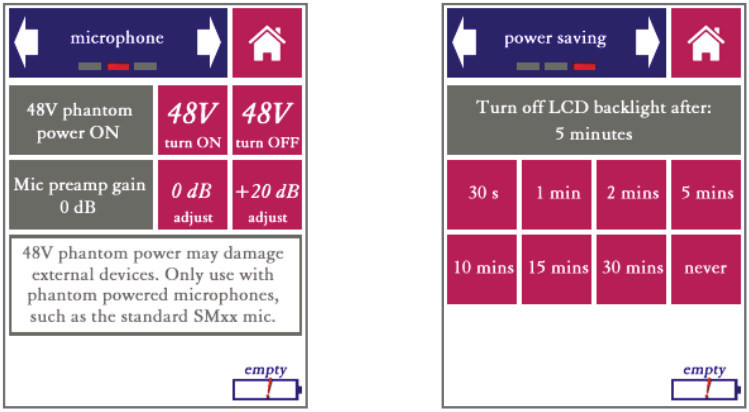
The system date and time are changed by means of the arrows (up/down). Remember that you changes are not applied until you press “set clock.”

Date and time in the settings module

The VOX-01 has an internal real-time clock that keeps running even when the device is powered off. The clock needs to be adjusted if the battery has been depleted completely, for instance when the device has not been used for a very long time. The system date and time are used for time-stamping the saved data. If you download measurement data over USB, the file creation date/time are only accurate if the internal real-time clock of the VOX-01 was updated to the right date and time.

Press the "calibrate touch" button if the response of the touch screen appears to be inaccurate. Calibration takes place by pressing exactly on the indicated marks near the corners of the screen.

We strongly recommend that you use a stylus for calibration, to obtain calibration settings that are as accurate as possible. Not that false responses during the calsibration procedure (tapping completely in the wrong place) may render the touch screen unusable.



Microphone pre-amp settings (left) and power saving settings (right)

The internal microphone amplifier of the VOX-01 features an adjustable gain setting. Adjust Adjustment of the pre-amp gain is hardly ever necessary, since the system has a very wide (linear) dynamic range of 130 dB. However, if you wish to connect an external signal source which operates at lower signal levels than the VOX-01 microphone, you can choose adjust the pre-amp gain by (approximately) +20 dB. Note that this value of +20 dB is not exact; recalibration will be needed. With the standard microphone, this setting should be 0 dB.

You can also set the backlight to automatically switch off if the touch screen has not been touched for a while. This time-out can be set between 30 seconds and 30 minutes, or the backlight can be set to never turn off at all.

The backlight time-out option saves a considerable amount of battery power. But keep in mind that it will cause the screen to black out *without turning the device off*. Don't forget to turn the device off when you finish working with the device; the fact that the screen is dark does not necessarily mean that the device is turned off. If the LED next to the USB port burns, then the device is still turned on. To turn the backlight back on again if a backlight time-out has occurred, press the power button. The touch screen will not respond to presses while the backlight is turned off, but measurements will continue to run whether the backlight is on or off.

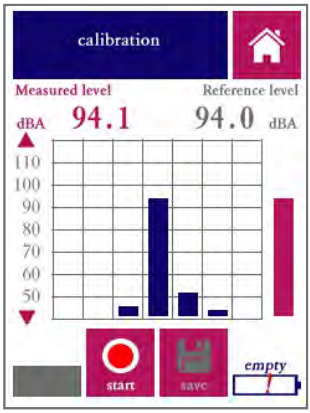
Calibration

The VOX-01, the instrument itself as well as the microphone, is calibrated before leaving the factory. A calibration certificate is included with the device. However, it is recommended that you carry out your own “user calibrations” from time to time, especially under the following conditions:

- You are using the device in temperatures considerably above or below room temperature
- You are planning to use the device again after a prolonged period of storage
- You are planning to do measurements for which a high degree of accuracy is required, e.g. certification measurements

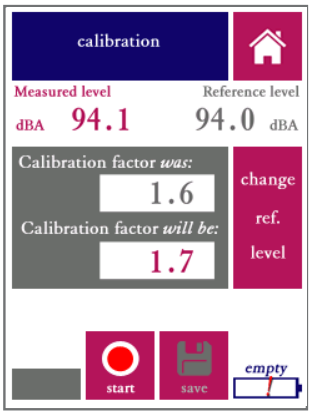
Compact calibrators (with Class 2 / Type 2 compliance) are available from a number of vendors. These calibrators generate a test tone which is adaptively adjusted to a fixed, accurately know signal level (usually 94.0 dB). This makes calibration relatively easy: insert the microphone tip into the port of the calibrator, using an adapter with suitable dimensions for the microphone tip (1/4” / 7mm). The device should now measure the nominal signal level produced by the calibrator.

The VOX-01 is easily calibrated with any stable sound source of a known reference level. This can be a calibrator, but a steady sound field (the level of which is measured by another, calibrated, SPL meter) will also work.



Calibration module while measuring a 1 kHz calibration tone.

To start calibrating, apply the calibrator to the microphone, or place the microphone in a known sound field. Then press “start.” Do not worry if the reference level shown is incorrect; you can change this after the measurement. An octave band spectrum will be shown while the equivalent-continuous A-weighted sound level is measured. Once this measurement is finished, the VOX-01 will show the results.



Calibration module showing calibration results.

The new calibration factor (sensitivity adjust) of the device is shown, as well as the original calibration factor as currently used in the device. The differences between the old and new value are typically small (less than one dB), unless you have connected a different signal source or microphone than the device is currently calibrated for.

The calibration factor is derived from the measured LAeq, as well as the reference level of your calibration signal source. You can now change the reference signal level; press the corresponding button on the right of the screen, and enter the correct value. The calibration factor will be re-calculated.

If you are satisfied that the new calibration factor is correct, press save. Note that the new calibration settings only take effect once you press save.

We recommend that you verify your new calibration in the SPL meter app. Re-apply your calibration signal source, and check that the correct reference level is measured.

Once you press “save”, the measured calibration factor is committed permanently to the device’s non-volatile memory. This overrides earlier calibrations.

Status

System status information can be read using the status module If you contact SDi for technical support, you may be asked to provide some of the information displayed here (such as the firmware version and hardware revision). The status app is not used to make changes to the system.

Accessing saved measurements from a PC

When you connect the VOX-01 to the USB port of a PC or Mac, a dialog window will appear on the VOX-01 asking if you wish to start data transfer. If the VOX-01 is powered off when you connect it through USB, it will power on automatically.

The VOX-01 will present itself to the USB host as a mass storage device. This allows you to access the internal file system of the VOX-01. You will see these directories/folders:

- Battery: battery status information
- Calibr: Calibration data
- SPL: SPL measurement results
- STIPA: STIPA measurement results
- System: system files
- Update: place update packages here to update the firmware upon reboot

IMPORTANT: you can access the VOX-01 system files so that you can easily backup and restore the device. However, keep in mind that some of the internal software of the VOX-01 is run directly from the files displayed here. If you remove or change any of these files, your VOX-01 will not work properly anymore.

Instructions on how to perform firmware updates is given in the section 8 of this manual.

In order to process and analyze the results further, copy all results files from the VOX-01 to a local folder on your PC. If you leave the measurements on the VOX-01, then the VOX-01 will simply continue its measurement numbering series where it left off. If you remove the measurements, the VOX-01 will start over with measurement #1.

The measurement files are saved in .csv format. These files can be imported in almost all worksheet application, such as Microsoft Excel. This will allow you to analyse the data further, and pre-process the data for the purpose of reporting.

Remote control from a PC

In certain situations you may wish to control your VOX-01 remotely from a PC. To achieve this, keep the VOX-01 connected via USB, and run the "Remote Display" application under Windows. This application works on any 64-bit version of Windows. A self-extracting installer of the application is included on the flashdrive bundled with your device, and can also be downloaded from our website.

The remote display application does exactly what the name says: you will get the exact same controls that you have on the VOX-01 device itself, but the entire display is simply moved to a window on your PC.

The Remote Display application needs to have the exact same firmware version that your VOX-01 is running on. Make sure that you use the correct installer package for your model, and follow instructions in the installation process.

When you first run the application, you will have to choose the correct COM port (as assigned by Windows to the VOX-01). If you select the wrong port, or if you want to change the COM port setting later on, press TAB from within the Remote Display application. You can now select any of the available COM ports on your PC.

The resolution of the display is 240x320 pixels. You can stretch the window of the Remote Display application to enlarge it. It may be convenient to use an enlarged version of the display (e.g. in classroom settings), but while increasing the size, the resolution remains 240x320. It is therefore normal for the enlarged display to look somewhat blurry.

All functions on touch screen on the VOX-01 are temporarily disabled as soon as a connection to the Remote Display application is made. Touch the display to return control to the VOX-01

Always make sure that you are using high-quality USB cables, especially when operating with a long cable between the VOX-01 and your PC. Most USB connection issues are traced back to poor quality cables.

5. Power and charging

Charging instructions

We recommend that you charge your VOX-01 only with the USB charger supplied with the instrument. Alternatively, you can charge the device through any external USB wall charger ("wall wart") with a charge current of 1500 mA or higher. Some PCs allow increased charge currents to be drawn from their USB ports (sometimes through special ports marked "Boost" or "Charge"). These can then also be used to charge the instrument.

Note: the instrument will NOT charge from a standard USB port on a PC or Mac. The current supplied through a computer USB port is normally insufficient to charge the device. The fact that the device may be powered from such a USB port does not necessarily imply that there is sufficient current left to also charge the battery.

The VOX-01 has internal charge circuitry that optimizes your charge time while safeguarding the life span of your battery pack. If you are not using the VOX-01 for a prolonged period, you can safely keep the VOX-01 connected to a charger. A small "trickle charge" will be drawn, making sure that your VOX-01 stays at full charge.

A few charging tips:

- When connected to the supplied charger, the battery is usually at 90% charge within 2.5 hours. The last 10% is topped off at a much lower current. When in a hurry, you may choose not to wait for this much slower "top off phase."
- A LED next to the USB shows the charge status. While blinking (alternating between green and orange), the battery is still charging. The LED burns constant green as soon as the battery is full.
- If you find, over time, that the battery capacity is reduced significantly compared to its original capacity, we recommend that you fully discharge the batteries, and then fully recharge them. If necessary, this procedure may be repeated a few times.
- If the battery charge indicator appears to become inaccurate (e.g., the battery is drained quickly from the point that the indicator still shows 50% charge), it also helps to completely discharge and recharge the battery.
- If you start using the VOX-01 after a long period of storage, we recommend that you first top off the charge before using the instrument. You may also want to check if the date and time settings were preserved.

- It is normal for the total battery capacity to slowly decrease over time. After 500 charge/recharge cycles, the battery capacity is normally at 80% to 90% of its original capacity, depending on the way the device is used and recharged.

- We recommend that you do not charge while measuring. The instruments' measuring electronics are highly sensitive; the digital charging circuitry may have an impact on the noise floor of the pre-amplifier and microphone, while noise and hum from the AC charger may also be inserted. Although the electronics have been protected against such sources of interference, we still recommend against recharging while doing actual measurements.

Power saving recommendations

How long the device can be used on a single charge depends on the mode and intensity of use. Power conservation settings can be controlled from the device's "hardware settings" menu. With its default settings, approximately 350 STIPA measurements can be carried out over the course of an 8 hour day without recharging.

Some ways to extend the battery life:

- Switch off the device when you do not plan to use it for a while.
- Choose conservative power settings in the hardware menu. The LCD backlight is a considerable factor in the overall drain on the battery.
- Disable "pre-amp phantom power" if you use a microphone that does not need it.

Use of power banks and external battery packs

For very long measurement sessions, the battery capacity of the internal battery may be insufficient. If you cannot spare a few hours of recharge time in the middle of your session, we recommend that you use an external USB battery pack (aka power bank). You can also power the VOX-01 from an AC power source through its own charger (or any USB power source), but it is not recommended to power the device this way while measuring. The device will be more susceptible to electronic noise and ground loop effects. Even though the device has been certified to comply with the applicable EMC standards, also when connected to an AC source, the signal quality is always slightly better when powered from batteries.

When you connect the VOX-01 to an external battery pack, a dialog will appear asking you whether you want to charge the device. We recommend that you do not recharge the internal battery from the power bank, so choose "no." This way, all power will be supplied by the external power bank. The internal battery will not be charged, nor discharged, while measuring. Note that the battery pack should have an output current rating of at least 1500 mA.

6. Cleaning, maintenance and calibration

With normal use, no further maintenance is needed beyond normal cleaning periodic re-calibration of the device. We recommend that you have the device checked and calibrated at our factory or at an external calibration specialist at least once every 2 years.

We recommend having the battery pack replaced after approx. 500 charge/recharge cycles.

We recommend that you clean the instrument with a soft cloth. LCD display cleaner can be used to clean the touch screen, provided that the following precautions are taken:

- Do not spray cleaner directly onto the display
- Only use cleaning liquids specifically intended for LCD screens

Battery disposal

The device contains an 4.8v rechargeable NiMH battery pack. At the end of the life cycle of this product, care should be taken to dispose of this battery pack responsibly, in compliance with rules and regulations for recycling of batteries that apply in your region. MAKE SURE THAT THIS BATTERY PACK IS REMOVED BEFORE DISPOSING OF THE DEVICE. If you are unable to remove the battery pack youself (by unscrewing the back lid of the device), make sure that you mention the presence of an NiMH battery pack when hand in the entire device for recycling.

7. Product warranty

The device is covered by a full-service, worldwide pick-up & return warranty until 24 months after the date of purchase. Please direct all warranty claims to:

SDi,
1345 Campus Parkway, Suite A18
Wall Township,
NJ 08736
Tel: 732-751-9266
Fax: 732-751-9241
Email: sales@sdifire.com
Web: www.sdifire.com

Please email us and wait for our response (typically within a business day) before shipping your hardware back. We may ask you to fill out an RMA form, and we will supply you with a reference number for your warranty claim. If you can provide a complete statement of the problems you are experiencing, this will help us solve your hardware issues as soon as possible. Always provide the ID number of your device (found on the bar code label on the back of the device), your name and address, and your date of purchase. If you did not purchase directly from SDi, also include dated proof of your purchase.

In general, our warranty programme covers all defects except for those resulting from accidents, misuse (including improper electrical connections) and improper maintenance. The following is explicitly excluded from product warranty:

- Any damage resulting from dropping, falling or excess vibration
- Any damage done by liquids, including damage resulting from excessive use of screen cleaning liquids
- Any damage resulting from incorrect electric connections to the device through the USB and/or audio connectors
- Any damage done by power surges or overvoltage on the USB power supply and/or audio connector
- Any mechanical damages to the display caused by mechanical forces applied to the screen surface, such as scratches.
- Normal wear and tear

The following voids warranty:

- Repair attempts by an unauthorized party
- Replacement of battery packs by an unauthorized party
- Removal of product stickers, tamper proof seals, bar codes or serial numbers

Malfunctions that are found to result from any of the above conditions are not covered by warranty. Repairs will take place only at the expense of the owner. If claimed under warranty, an examination fee may be charged and transportation costs will be charged to the owner.

Please do not attempt to open your VOX-01 yourself, as there are no user-serviceable parts inside. If you do see a legitimate need to open the device yourself, please contact SDi first, so we can discuss preserving your warranty rights. Please be aware that the product is protected by tamper-proof seals.

A worldwide pick-up and return service is included in the warranty. This means that we will have the defective unit picked up at your location at no charge, provided that it is presented in its original equipment case, packed in a cardboard box with suitable cushioning material.

Service/maintenance contracts are available from SDi. For further information, please contact SDi at: service@sdifire.com.

8. Firmware updates

Firmware updates are released through the website www.sdifire.com. Before updating your firmware, always check: www.sdifire.com/support/#productsoftwareupdates

- If the update you downloaded is intended for your device type (the VOX-01)
- If you have sufficient battery charge to complete the update cycle without interruption

Interrupting the power supply during the update process may render your device unusable. If this happens, try to repeat the update procedure. If this does not work, please contact support@sdifire.com.

Executing a firmware update is easy:

- Choose and download the correct firmware update package from www.sdifire.com
- Connect the VOX-01 to any PC or Mac through USB
- When prompted on the LCD screen, choose “connect through USB”
- The VOX-01’s internal file system can now be accessed from your computer in the same way as any mass storage device
- Copy the firmware updated package to the folder named “updates”
- Now restart the VOX-01 using its power button

The firmware update procedure will automatically start. You will be able to see the progress of the update procedure (which may take between 3 and 30 minutes, depending on the size of the update package) on the LCD display.

Never interrupt the firmwate update procedure. Make sure that the VOX-01 is fully charged or connected to a stable power source before starting the update procedure.

Please be aware that the update procedure may take a significant amount of time, depending on the update package that you are installing.

9. Technical specifications

Functionality	Speech Transmission Index (STIPA) Octave band Real-Time Analyzer (in STIPA pro mode) Sound Pressure Level meter (A, C, Z, slow, fast, Leq) *Anounced for 2014 firmware updates*: 1/3 and 1/1 RTA, FFT analyzer
Standards compliance	IEC 60268-16 rev. 4, IEC 61672 (class 2), ANSI S1.4 (type 2)
Acoustic	Effective noise floor: < 26 dB(A) Linear range: 30 -124 dB (with supplied microphone) Linear range, electric input: 22 - 125 dB
Microphone	Omnidirectional free-field microphone Flat frequency transfer (conforms with class 2 / type 2 requirements) 48V phantom powered 30 mV/Pa sensitivity
Display	Resistive LCD touch screen 320x240 pixels, 65k colors Luminance typ. 250 Cd/m2 Durability: 100k finger slides, 1M taps
Data storage	4 GB internal storage for data and program code Accessible from PC through USB (mass storage mode)
Environmental	Temperature: 5 -35C (41-95F) Relative humidity: 5% - 90% (non-condensing)
Power	NiMH battery pack 4.8V nominal, typ. 2200 mAh Typical battery lifetime >4h Max. charge current 1.8A
Electromagnetic compatibility	Complies with EN 61326-1:2006 FCC part 15 compliant (class A device)
Mechanical specs	Size approx. 210 x 85 x 55 mm (excl. microphone) Weight 530 g (including microphone) Rear-mounted tripod adapter Hook for carrying cord
Bundled items	Carrying case, measuring instrument, class 2 microphone, USB charger, int. charger adapters (US, EU, UK,AU), USB charging/data cable, manual, carrying cord, USB flash drive with test signals

10. Troubleshooting

Problem	Possible cause	Solution
System does not power on after pressing power button	Battery empty	Connect wall charger for at least 30 minutes
System does not recharge after connecting through USB	Charge current too low	Use bundled wall charger; standard PC USB ports do not supply enough current to charge
Display shows error messages (green text).	Error on display processor or in communication between DSP and display processor	If the problem persists, contact support.
Battery lifetime is too short	Battery not fully charged Battery is worn	Keep device on charger for at least 4 hours Have battery replaced after approx. 400 charge cycles
Battery indicator is inaccurate	Battery charge measurement system poorly calibrated (e.g. due to self-discharge after prolonged shelving)	Completely drain the battery, and then fully recharge. Repeat if necessary.
Device warms up during use	Lack of ventilation	Warming up of the device to temperatures of approx. 35°C/95°F is normal. If the device runs considerably hotter than that, check ventilation and contact support if the problem persists
Device not recognized by PC when connected through USB	Driver problem Device in measurement mode	Update PC drivers (VOX-01 is approached as a mass storage device) Select USB data transfer mode when dialog window appears on the VOX-01 screen
Display backlight turns off, no response to touch screen	Backlight time-out event	Adjust backlight time-out in power saving settings. Pressing power button turns the display back on
Device “hangs,” becomes unresponsive, or will not power up after resetting, and/or LED next to USB port burns red.	Internal software problem	Keep the power button pressed for 10s. This forces the device to shut down. Then press the power button again to restart. If the problem persists, contact support

6.3 Full STI

New in v2.0

The Speech Transmission Index (STI) can be measured by means of various test methods. The STIPA method, as implemented by the Quick STIPA and STIPA pro modules, is a fast and efficient version of the STI originally developed for public address systems. Although fast and robust, STIPA has its limitations: only 2 modulation frequencies are measured per octave band, whereas the complete Speech Transmission Index measurement scheme calls for 14 modulations per octave band. This means that STIPA is undersampled in the modulation domain. For many systems, the measured STI is not (or hardly) affected. However, some cases call for "Full STI" measurements:

- Whenever echoes are present (delayed loudspeakers, large halls and cathedrals)
- When tested systems or channels feature complex combinations of distortion factors.

Full STI measurements were available in commercial measuring tools up to the late 1990s, but have subsequently been absent from the market for two decades. The fact that a full STI measurement used to take around 15 minutes made Full STI measurements entirely impractical. Also, the introduction of STIPA around 2002 made a reasonable alternative available.

The Full STI module now available on the VOX-01 fully implements every aspect of the Speech Transmission Index model, making it the most universally applicable speech intel-ligibility metric to date:

- Fully compliant with the Full STI definition according to IEC-60268-16
- Computes the complete 14x7 Modulation Transfer Function matrix
- Uses an efficient algorithm that completes the measurement in approx. 1 minute
- Implements the *direct measurement method* as defined in IEC-60268-16

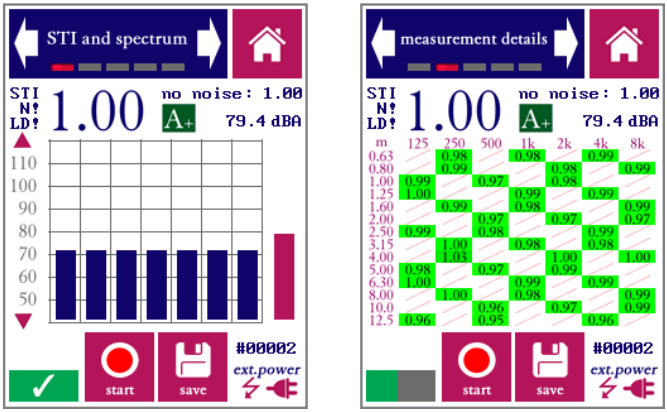
The "direct method" (in which a modulated test signal is presented to the channel under test), as implemented here, has crucial advantages over the "indirect method" (where the STI is estimated based on a measured impulse response). The indirect method implicitly assumes that the channel under test is a linear time-invariant system. Whenever electro-acoustic components are involved, the tested channel never fully satisfies the linearity re-quirement. Indirect estimates are notoriously inaccurate in many real-life scenarios, but have nonetheless been used extensively, for lack of alternatives based on the direct method (such as this module).

The Full STI module implements a novel measurement algorithm, that leverages the ad-vanced signal processing capabilities of the VOX-01. This algorithm, which is documented separately in an Embedded Acoustics white paper, has: he following characteristics:

- A novel test signal is used, which repeats 7 different patterns (segments) in a circular fashion.
- Each pattern roughly follows the approach of STIPA: each octave band is simultaneously modulated with 2 modulation frequencies.
- Each pattern takes approx. 9 seconds to complete. The whole measurement is completed in 65 seconds.
- The patterns are set up in such a way that all modulation frequencies (out of the set of 14) have been used in each octave band once the full 65 second cycle is completed. Hence, all 14 modulation frequencies are tested in all 7 octave bands.
- The first phase of a new measurement is a synchronization phase, during which the analysis algorithm determines when to expect transitions between patterns.

The Full STI test signal is included on the flashdrive bundled with the VOX-01, and will be available on the VOXBOX starting May 2017. Note that the Full STI signal is copyrighted material; all audio files of the signal released by Embedded Acoustics are watermarked. Use of the signal other than directly with the VOX-01 requires a license from Embedded Acoustics.

The measurements themselves are no more difficult or complex to carry out than STIPA measurements. The procedure is largely the same; only the duration is longer and the results are more universally representative of true speech intelligibility.



Full STI measurement result (left) and MTF details (right)

The Full STI module has the same overall design as the STIPA pro module, including the option to computationally add noise. The main difference is the second screen, which visually represents the Modulation Frequency Transfer (MTF) matrix as it gradually fills up during the measurement. The user has the option to stop the measurement before the full cycle has completed, shortening the duration of the measurement. This makes sense if the STI remains stable across multiple phases of the signal. The result of a prematurely

ended Full STI measurement can be thought of as a compromise in between STIPA and Full STI.

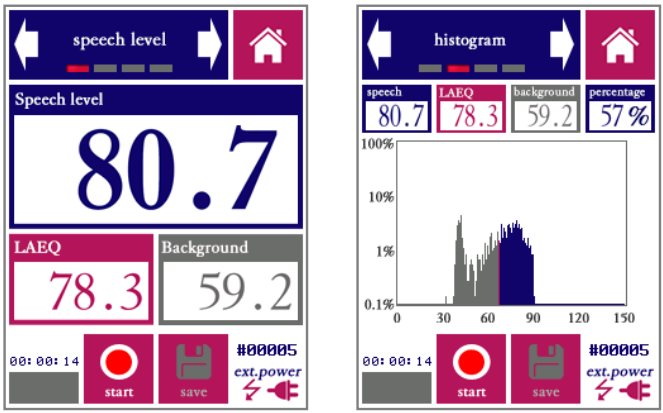
Please refer to the section on the STIPA pro module (page 11) for a description of the various features and controls of the module (additive noise, qualifications bands, disabling level-dependent masking, etc).

6.4 Speech Level Meter

In the context of speech intelligibility measurements, special care is needed when determining the sound pressure level of running speech. As human talkers use their articulators to form speech utterances, they alternately produce high-intensity bursts of acoustic energy and naturally occurring pauses. Across the length of a spoken sentence, periods of silence roughly account for half of the total time (length) of the sentence. Those pauses do not necessarily contribute to the intelligibility of the sentence, but they do have an influence on the overall (equivalent continuous) sound pressure level of the sentence. There is a firmly established relation between speech-to-noise ratio (SNR) and speech intelligibility - but how do we determine the speech level to calculate (SNR)?

It has been shown that removing the pauses from speech increases the correlation between SNR and subjective speech intelligibility. In the 1990s, a method was developed within European ESPRIT project 2589 (SAM) to assess speech levels while removing the influence of natural pauses. This method is known as Speech Level Meter (SLM) and is included in IEC-60268-16 as part of a normative annex (Annex J). This Speech Level Meter module is a direct implementation of this method.

The procedure consists of the compilation of a level histogram, which normally reveals a bimodal distribution: a low-level mode which represents the background noise, and a higher-level mode which represents speech. The RMS of speech and background noise can be calculated separately by summing the two modes in the histogram separately. The criterion for separating the two modes is a threshold that is set 14 dB below the SPL presumed to correspond to speech.



Estimated speech level (left) and histogram on which the estimate is based (right)

To use the Speech Level Meter, simply carry out a measurement while sampling running speech. The SPL of speech and background noise are calculated, as well as the total LAeq.

8.2. Noise curves noise curves

The “noise curves” module implements a series of measurement methods to evaluate noise levels, based on sets of standardized spectral curves. The objective of these methods is to set criteria in terms of a single-number rating, while taking the spectral characteristics of noise into account.

The following methods are implement

Noise Rating (NR). This is an ISO-standardized (ISO-1996) method. Although the method is being pushed into the background by successive updates to the relevant standards, it is still seeing a fair amount of use, in particular in Europe.

Noise Criteria (NC). This method is frequently used in the United States, mostly for evaluating background sound in buildings and for specification of desired levels in advance of construction. Different versions of the NC have been in circulation since the 1950s; the VOX-01 implements the version standardized through ANSI S12.2:2008.

Preferred Noise Criterion (PNC). This is a variant of NC, not included in ANSI S12.2, but proposed originally by Beranek et al (1973) to yield a better correspondence with perceived annoyance by putting more emphasis on the lowest frequency bands and highest frequency bands.

Balanced Noise Criterion (NCB). Standardized through ANSI S12.2:1995, similar in purpose and application to NC; apparently intended upon its introduction to replace NC.

Room Criteria (RC). This method is primarily used to quantify noise from HVAC systems in buildings. In addition to the single number rating (e.g. RC-35) a spectral classification of the signal is also given: Neutral (N), Hiss (H), Rumble (R) and Rattle and Vibration (RV).

Room Criteria mark II (RCII). Updated version apparently intended to eventually replace RC curves.

The Room Noise Criterion (RNC) method is currently not implemented on the VOX-01.

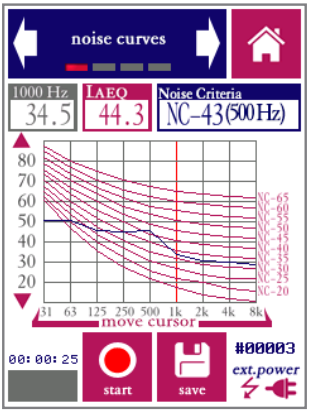
Each method has its own series of preferred limits, depending on the purpose of the room in which it is measured. ANSI S12.2 contains table of recommend maximum NC and RC values, and additional information is available through an abundance of online resources. A full list of these recommend limits is beyond the scope of this manual.

As part of the calculations, various intermediate metrics are calculated including the Speech Interference Level (SIL).

Each method uses its own procedure for rating noise spectra based on the series of curves associated with the method. The so-called "tangency method" plays a central role for NC and related measures; the rating is effectively determined by the highest NC curve "touched" by the spectrum. The frequency band that touches the highest curve (the most dominant noise band) is indicated as part of the rating, e.g: NC-53(125Hz).

A full description of the rating procedures is beyond the purpose of this manual. Please consult the corresponding standards for this information.

Carrying out a Noise Curves measurement is similar to an SPL or RTA measurement: set the duration of the measurement and other parameters, and start the measurement.



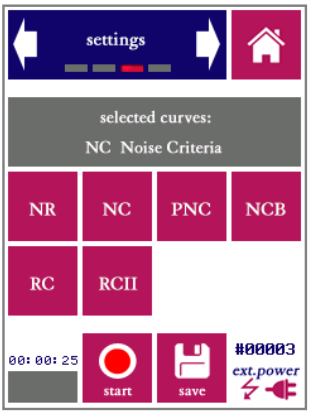
Noise curves. In this example, the curves and rating for NC are displayed

During a measurement, the reference noise curves are shown as red lines. The actual measured spectrum is shown as a blue line. The cursor can be moved around to read the SPL at any of the frequencies. The rating is shown, as well as the LAeq level.

Only one Noise Curves metric can be displayed at a time, but all metrics are calculated for every measurement. If a measurement is saved, the saved file contains data for all noise curve metrics. If you wish to evaluated more than one noise curve metric without measuring more than once, this can be done as follows:

- Select the first type of curves you wish to evaluate (e.g. NC)
- Carry out the measurement.
- Save the results
- Now change to another type of curves (e.g. NCB)
- Go to the measurement browser screen. NCB data will now be displayed
- Repeat this procedure to inspect results for further metrics (RC, RCII, etc).

The second screen of the module is used to set the duration of the measument. Selecting curves (and the associated rating method) is done in the third screen of the module.

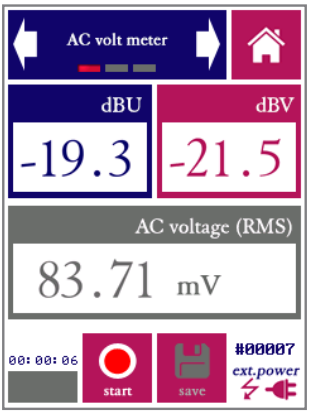


Choose from the available noise curve metrics

9.2. AC Volt meter

The AC Volt meter module is a simple tool to quickly assess the output level of line-level audio equipment. The line output of a device is connected directly to the XLR input of the VOX-01 (after removing the microphone). The VOX-01 then measures the signal level and expresses it in the following three units:

- V rms
- dBU
- dBV



AC Volt meter

The XLR connector supplies 48V phantom power to the microphone. This phantom voltage can be switched on and off through the hardware settings menu. IMPORTANT: connecting equipment not designed for 48V phan-tom power to the XLR connector (with phantom power switched on) may permanently damage the connected device and/or the VOX-01. Disable phan-tom power before connecting to external equipment.

The "AC Volt meter" function of the device is intended for measuring audio output levels of amplifiers and other audio equipment. NEVER connect the XLR input pins to AC voltages over 40V; do NOT try to measure the AC mains with your VOX-01.

SDi,
3535 Route 66, Building 6
Neptune, NJ 07753
Tel: 732-751-9266
Fax: 732-751-9241
Email: sales@sdifire.com
Web: www.sdifire.com

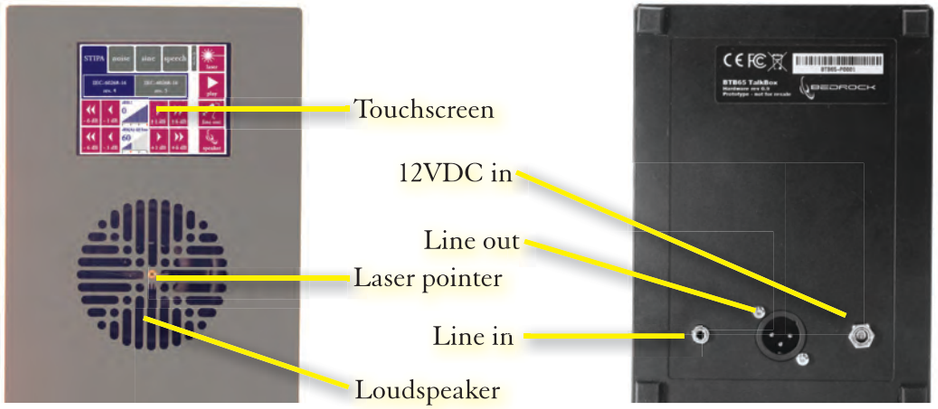
VOX
SPEECH INTELLIGIBILITY TESTER

VOXBOX

VOXBOX
Universal calibrated acoustic reference signal source for STIPA and other test signals

CE

Quick start guide



Instructions for first use

The VOXBOX ships in a protective carrying bag which contains the following:

- The VOXBOX itself
- 110 - 240 VAC to 12 VDC power supply
- Power supply international adapters (US, EU, UK, AU)
- Calibration certificate

Please check that all components are present and undamaged before using the VOBOX for the first time. Before powering up, be sure to take note of all instructions and warnings in this Quick Start Guide. Choose the international adapter suitable for your region. Note that the VOXBOX comes precalibrated. This means that the device is immediately ready to be used. We do recommend to periodically check that the sound level calibrations are still accurate, and adjust calibration settings if needed.

For more information, and the latest version of all VOX and VOXBOX documentation, please visit our website:

www.sdifire.com

General use and safety precautions

The VOXBOX is a sophisticated and sensitive piece of test gear that should be used, maintained and stored with care:

- Do not expose the VOXBOX or any of its components to liquids or moisture
- Do not use in any environment or atmosphere that may contain flammable or explosive materials
- Protect against heat, high temperatures and flames
- Do not leave the device unattended for long periods of time while operating

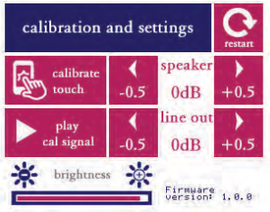
When using the laser pointer, take precautions to prevent yourself and others from looking directly into the beam
Sound levels at short range may exceed levels known to be harmful to the human hearing organ. Do not put your ear directly to the loudspeaker, especially when connecting or disconnecting the power cord.

The supplied power supply is designed for worldwide operation on any AC source (100V-240V). Use with the appropriate adapter for your region. Do not use if wet, cracked or broken. Use of alternative 12V DC power sources is at your own risk.

Setting up and calibrating

The VOXBOX boots up showing a splash screen (see bottom left image). To bypass this screen and launch straight into the main menu, touch the blue bar at the bottom. To access the setup and calibration menu, press the red button on the right. This menu (bottom right image), which you would need to use only rarely, allows you to:

- Calibrate the touch screen if touch appears inaccurate, by touching marks with a stylus
- Play a calibration tone. This button is primarily for factory calibration
- Adjust the level calibration settings for line out and loudspeaker. This will affect the overall level of all signals, and is to be used to compensate for drift in level calibration over time.
- Adjust the brightness of the LCD display



VOXBOX

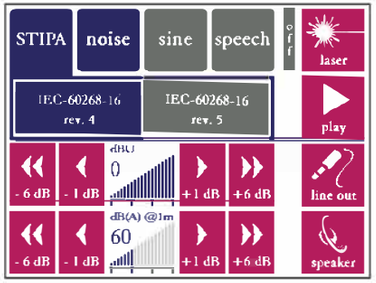
VOXBOX
Universal calibrated acoustic reference signal source for STIPA and other test signals

CE

Selecting a signal

The user interface of the VOXBOX shows virtually all buttons and controls on a single screen, allowing you to monitor the status of the device at a glance (see image below). The first step is always to choose which test signal you need, by selecting one of the tabs on the top of the screen: STI, noise, sine or speech.Once you select one of these tabs, the available signals for the chosen category will be displayed.

For the STI, you can choose between the STIPA signals compliant with rev.4 or rev.5 of the IEC standard (IEC-61268-16). Under the "noise" tab, you can select pink or white noise. The "sine" tab lets you browse through pure tones at frequencies between 125 Hz and 8 kHz. The "speech" tabs offers voice announcements in six languages (US, UK, FR, SP, GE, DU) to indicate the beginning and end of a test session, also allowing you to obtain a subjective impression of the signal quality of a channel under test.



Controlling signals and playback levels

The top right button toggles the state of the laser pointer. Use the laser pointer to accurately align the microphone under test with the center of the loudspeaker. We recommend turning the laser off once alignment has been completeted. The Play/Pause button is used to start and stop the signal generator. Speech signals are played once; test signals which are theoretically of infinite duration play continuously until stopped.

The line out channel and the loudspeaker channel act as independent generators, producing the same signal but controlled independently. Press the button with the line out symbol to mute/unmute line out, and the button with the loudspeaker symbol to mute/unmute the loudspeaker. The volume controls for each channel are shown alongside their respective mute buttons.

The output levels are adjusted in steps of 1 dB or 6 dB (using separate buttons for 1 dB and 6 dB steps). Note that the indicated loudspeaker level is the A-weighted SPL at a distance of 1m off the loudspeaker, under anechoice conditions. In reality, the level measured at 1m distance is likely to be higher due to room reflections. To verify the level calibration, we recommend measuring at a distance of 0.25m, which should result in a level reading 12 dB above the chosen output level.

NOTE: inserting any plug into the 3.5mm line input jack overrides the internal generators, essentially turning the TalkBox into an (uncalibrated) active loudspeaker (e.g. for use with a smartphone or music player).

STIPA measurements in practice

The most common application of the VOXBOX is as a calibrated signal source for STIPA measurements. If you need to measure according to a specific application standard (such as NFPA72), please refer to the applicable standard for exact instructions on placement and distance of the microphone under test relative to the VOXBOX.

The VOXBOX simulates a human talker. Commonly, the reference speech level of a human talker is presumed to be 60 dB(A) at 1 meter distance, but different values may apply. The VOXBOX can be adjusted to any level between 54 dB(A), corresponding to relaxed speech, up to 72 dB(A), which corresponds to a raised voice. Choose the appropriate level and distance between TalkBox and tested (paging) microphone, and align the microphone with the aid of the laser pointer.

- Now select the test signal you aim to use, and press "Play." You will hear the test signal playing.
- Activate the system under test, such that the test signal can be heard at the targeted listener locations. Set the parameters of the system under test (such as the system's volume controls) to a representative setting, or vary these parameters systematically.
- Now use a STIPA measuring instrument (such as the VOX-01) to obtain STI readings at all relevant listener locations. You can choose to have the STIPA signal play continuously, or pause/mute inbetween measurements.
- The STIPA signal is compatible with all STI measuring instruments that comply with IEC-60268-16 rev.3 or higher.

Factory calibration and warranty

Your VOXBOX was thoroughly inspected and calibrated before leaving our factory. A calibration certificate is included with your instrument. As any acoustic measuring instrument, the VOXBOX needs to be factory-recalibrated periodically. Our recommended maximum calibration interval is 2 years.

If the instrument "hangs," becomes unresponsive or generates error messages, disconnect the power connect and keep disconnected for at least 10 seconds before reconnecting. If the problem persists, contact the manufacturer.

The VOXBOX is covered through the manufacturer's worldwide warranty programme for 24 months from the date of purchase. This warranty programme covers all defects, except for those resulting from accidents, misuse (including improper electrical connections) and improper maintenance. Explicitly excluded from warranty are signs of normal wear and tear, scratches on the LCD screen, cracks from falling or dropping, damage resulting from improper electrical connections and water damage.

Please direct your warranty claims to:
SDi,
3535 Route 66, Building 6,
Neptune, NJ 07753
Tel: 732-751-9266
Email: sales@sdifire.com Web: www.sdifire.com

IEC-60268-16 rev. 4 & rev. 5

VOXBOX

Operating manual

Document version 2.0

Contact information and support

The VOX product line, including the VOXBOX TalkBox, is designed and manufactured in the Netherlands and sold by SDi in the United States.

SDi can be contacted at the following address:

SDi Fire
3535 Route 66
Building 6
Neptune, NJ 07753
(732)-751-9266

NOTE: All screenshots and product pictures shown in this manual correspond to the VOXBOX with hardware platform 2.0 running firmware version 3.0.0 or higher. If you are using a different device model or a different firmware version, the screenshots may not fully correspond to what is being displayed on your device's screen.

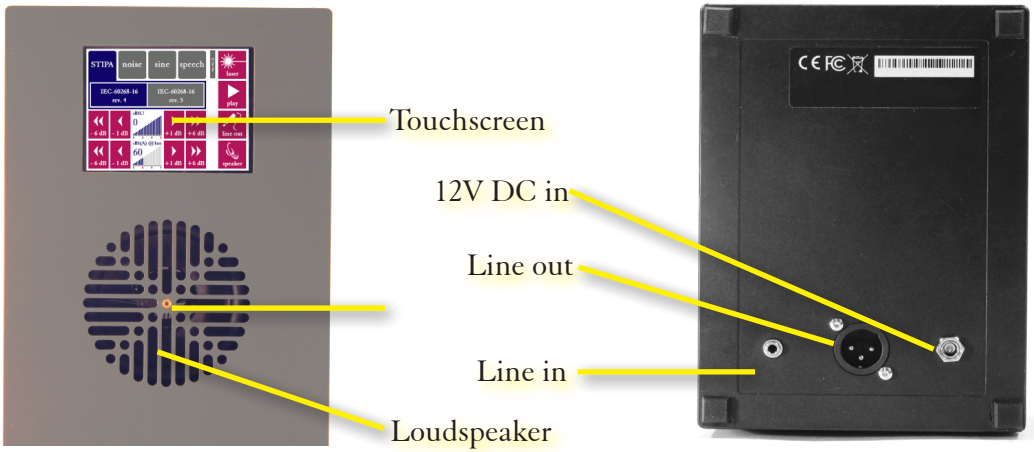
Document version 2.0, release date June 2017. Applies to models: VOXBOX

Contents

1. Introduction

Congratulations on purchasing your VOXBOX talkbox. The VOXBOX is a versatile and reliable signal source for acoustic measurements, including STIPA and full STI speech intelligibility measurements.

Using the VOXBOX is quite easy, thanks to its intuitive touch-screen interface. Most users will get the hang of doing measurements with the VOXBOX without spending too much time with this manual. Nonetheless, we strongly recommend that you do read this manual before using your VOXBOX for the first time, in order to get acquainted with the various features of the device, as well as the procedures for calibration and maintenance.
With a little care, you can expect years and years of reliable and trouble-free operation from the VOXBOX.



2. General use and safety precautions

2.1. Protecting your device

Your VOXBOX contains a high-sensitivity wideband loudspeaker that was calibrated at the factory for accurate control over the reproduced sound pressure levels and frequency transfer function. To make sure that the performance of your VOXBOX remains undegraded over the years, we recommend taking the following precautions:

- Protect the VOXBOX from dropping, shock and vibration. If you use a tripod to mount the device during measurements, we recommend that you use a sturdy model with a sufficiently wide base.
- Do not expose the device or its power supply to rain, moisture or liquids of any kind. Take special care to prevent liquids to permeate into the device through the connectors or along the display bezel.
- Do not operate at ambient temperatures above 35°C/95F.
- Do not use close to flames or open fire.
- Do not use in environments where flammable or explosive materials may also be used.
- Do not keep the device powered on while unattended for prolonged periods of time.
- Use the power supply only with the international adapter suitable for your region.
- During transportation and storage, keep the device in a suitable casing or container – preferably its original case. The device needs to be protected from shocks and vibration (due to transportation or falling), excessive temperatures, liquids and moisture, and any other external conditions that could do damage to the device. Care should be taken that other objects cannot come into direct contact with the display during transportation.

2.2. Protecting yourself and others

Whenever using the VOXBOX, take precautions to keep yourself and others safe. In particular, take note of the following warnings related to electrical hazards, eye safety and hearing protection:

The included power supply comes with adapters for use worldwide, and operates on a wide AC voltage range of 100 – 250V. Do not use the power supply if the casing appears cracked or broken, or if it has been exposed to fluids or moisture. Contact with components inside the power supply while this is plugged in may result in serious injury or death.

The VOXBOX features a class II laser pointer to assist in placement of microphones. Never look directly into the laser, and make sure that others cannot accidentally look directly into the laser either. Do not use around children or animals. Do not disassemble or remove the laser from its enclosure.

The VOXBOX is capable of producing high sound levels at close range. Do not hold the ear up to the loudspeaker grille, and observe a distance of at least 0.6m (2ft) between your ears and the loudspeaker when operating.

3. How to use the VOXBOX

The VOXBOX is a calibrated test signal source for acoustic measuring purposes. When using the VOXBOX for generating test signals, the following tasks have been taken care of:

- Precise generation pre-determined test signals
- Equalization of these test signals
- Calibration of the absolute output level
- Playback through an acoustic and/or electric output

The VOXBOX simultaneously plays back test signals via a balanced XLR output jack (on the back of the device) and via its loudspeaker. The acoustic and electric output channels can be independently muted, and the output level is also controlled independently.

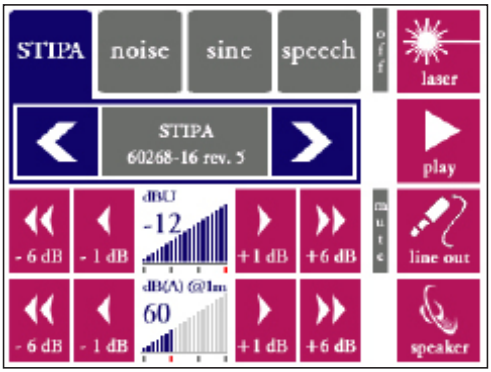
3.1. Splash screen while booting

When the VOXBOX is connected to power, it boots up immediately. The following "splash screen" is displayed:

Press on the blue bar at the bottom of the screen to skip directly into the main menu. Press the button "calibration menu" if you need to adjust the level calibration of the VOXBOX or to change any of the hardware settings. See section 3.3 for a description of these settings.

3.2. Main screen

As soon as you press the blue bar, or if you wait for a few seconds, the main screen of the user interface will be shown. The way the interface is designed you are able to observe all the relevant controls and settings at a glance.



Select any of the tabs on the top-left bar to access any of the four categories of test signals: Speech intelligibility (STIPA), Noise, Sine or Speech. Then choose the test signal which you need for your measurements. Consult chapter 4 of this manual for further explanations on the different types of test signals.

While the top-left section of the screen is dedicated to selecting a signal, the bottom-left part of the screen controls the output signal levels. Two individual gauges show the current output levels of the electric and acoustic output channels:

- The top gauge shows the electric output level on the XLR output (line out), calibrated in dBU. The level can be adjusted to any level between -30 dBU and -12 dBU.
- The bottom gauge shows the acoustic output level, defined as the A-weighted sound pressure level at a distance of 1.00m relative to the reference plane (the surface of the loudspeaker grille). In other words, this is the dBA-level measured at 1.00 m straight in front of the VOXBOX, when used under anechoic conditions. This level can be adjusted to values between 54 dB(A) and 72 dB(A)

Separate buttons are available for adjusting the level in increments of either 1 dB or 6 dB.

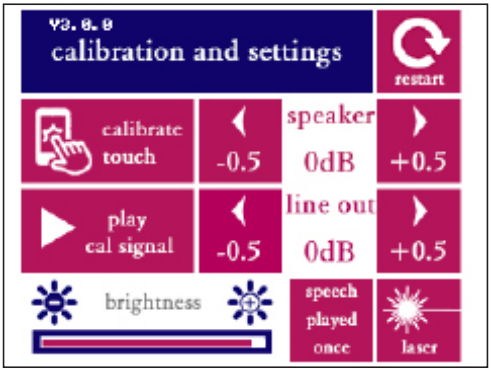
To the right of the level gauges (and adjustment buttons), you will find separate mute buttons for the line out and loudspeaker (with pictograms of a line jack and a loudspeaker). Mute/unmute each of the channels with these buttons. If muted, a grey indicator (“mute”) will appear next to the button.

This leaves only the two buttons unexplained, both found at the top right of the screen.

- The button marked “laser” toggles the laser pointer on/off. The laser pointer is useful when positioning a microphone in front of the VOXBOX, for accurate on-axis alignment. We recommend turning it off when it is not needed.
- The start/stop button does precisely what one would expect: it starts and stops test signal playback, simultaneously on both the electric and acoustic output channel.

3.3. Calibration menu

The calibration menu can only be accessed while the device is booting (see section 3.1). Any changes made in this menu take effect immediately, but the device needs to be restarted before the main screen can be accessed again.



Press the “restart” button at the top right of the screen to restart the device once you are done making adjustments.

The calibration menu can be used for the following purposes:

- **Adjusting the electric and acoustic input/output levels in 0.5 dB increments.** The output levels are accurately calibrated before any VOXBOX leaves the factory, and no particular attention to level calibration is normally required from the user. However, should there still be a need for minor adjustments, these can be done here. Note that a test signal playback button is provided within this menu, so that the effect of any calibration adjustments can be observed straightaway while making the adjustments.
- **Touch screen calibration.** Press this button if the touch screen digitizer appears inaccurate (the touch points appear not to be detected in exactly the right place). Be very careful with this option and use it only if needed (which should be rarely, if ever).

Improper use of the calibration routine will render the device inoperable. It will need to be returned to the factory by repairs (not covered under warranty). Always use a stylus when calibrating the touch screen. Do not press “confirm” unless you are certain that you touched the correct marks in the calibration pattern.

- **Display brightness.** Adjust the brightness by means of the slider or the + and - buttons.
- **Looping of speech files.** Press the button once to toggle between looped and unlooped play back of speech signals. This only applies to speech; all other signals (with the exception of the sweep) always provide continuous playback.

3.5. External power supply

The SDi VOXBOX operates off its external 12 V DC power supply. It does not have an internal battery; the device shuts off immediately when the power supply is disconnected. In most use scenarios, the VOXBOX is used near a lectern or paging microphone, in which case a mains outlet (100-250 V AC) will be available nearby. If this is not the case, alternative ways to power the VOXBOX will be more convenient. In particular, car battery adapters and external battery packs may come in handy.

Since 12V external batteries and car adapters are ubiquitous and inexpensive, we recommend sourcing any battery pack that meets your requirements in terms of size, weight and capacity. The pin-out of the DC jack is printed on the type label (on the back of the device). Feel free to contact us for recommendations on recent products that work well with the VOXBOX: service@sdifire.com

Note that the VOXBOX draws peak currents up to 3A. The external power supply must be able to accommodate such high current peaks, or the output signal is likely to be distorted.

3.6. Line-in jack

The VOXBOX has a 3.5mm line-in jack, which can be used for playback of audio from external sources.

Note that signals from the line in jack are not equalized; the spectral characteristics and level of the signal are not controlled. The line in jack is only intended to use the VOXBOX as a convenient playback device (powered loudspeaker) to listen to external recordings. Do not perform measurements based on external signal sources, unless you have ways to control (calibrate) the signal level and frequency transfer function externally.

4. Speech intelligibility measurements

A comprehensive explanation of the STI method and STIPA is beyond the scope of this device manual; there are several online and offline resources that provide guidance and information on doing STI measurements, such Embedded Acoustics' white paper on this topic. This manual assumes that the general principles behind Speech Transmission Index testing are known, as well as the basics of designing and executing STI measuring campaigns. This manual explains how to use the VOXBOX in this context.

First and foremost: note that you will need an STI analyzer (such as the VOX-01) for any of the measurements described in this chapter.

4.1 Setting up the VOXBOX for STI measurements

In most cases, STI measurements are set up to comply with specific regulations or application standards, such as NFPA-72 Annex D, NEN-2575, DIN-60849/DIN-VDE-0833-4, or BS-5839-8. Consult the applicable standards for guidelines on the exact setup as required.

In general, the setup procedure is as follows:

- **Place the VOXBOX in the appropriate environment;** most commonly this is at a control panel, lectern or any other position close to a microphone. **Note that the VOXBOX replaces the human talker that is normally part of the speech transmission chain.** Place the VOXBOX exactly where the talker's head would be. Use a tripod or other mounting materials if neccessary. The VOXBOX is fitted with an adapter for standard camera tripods at the bottom.
- **Align the microphone and VOXBOX;** make sure that the VOXBOX is radiating into the microphone as a human talker would. In some cases, the human talker would *not* talk directly into the microphone, e.g. if the microphone is mounted away from the talker, such as at the corner of a lectern. Make sure that the orientation of the TalkBox matches what a human would do. The laser pointer indicates the reference direction; use this to place microphones on-axis with the VOXBOX.
- **Adjust to the right VOXBOX-microphone distance.** The loudspeaker grille is the reference plane of the VOXBOX. Measure all difference relative to this plane.
- **Set the signal level to match the intended vocal effort.** Application standards usually require the sound pressure level to match a certain "nominal" level at 1 meter distance (e.g. 65 dB(A) for NFPA-72, and 60 dB(A) for many other standards. For "relaxed" speech, a setting of 54 dB(A) is common, whereas 66 dB(A) and 72 dB(A) are commonly adopted values when loud speech is expected.
- **Now play the signal.** It is often convenient to keep the signal playing continuously, while working with the STI analyzer to collect data at various measuring locations.

NOTE: IEC-60268-16 recommends a 3 dB adjustment when matching the level of a STI-PA signal to the level of recorded speech. This adjustment is needed to account for the pauses that occur naturally in speech, while the STIPA signal is fully continuous. This correction is already applied by your VOXBOX, according to the procedure described in Appendix J of IEC-60268-16 rev. 4. Simply set the VOXBOX at the playback level cited in your application standard.

4.2 STIPA measurements

The VOXBOX has two variants of the STIPA signal: the STIPA signal according to IEC-60268-16 rev. 4 (2011) and IEC-60268-16 rev. 5. Revision 5 is expected to be published late 2017 or 2018. The difference between the signals is a change in the long-term spectrum of the signal that has been implement in IEC-60268-16 rev. 5 (currently still in draft). The energy in the two lower octaves (125 Hz and 250 Hz) has been reduced, obtaining a better overall agreement with recent literature on human vocal effort.

The question which signal to use depends on the purposes of the measurement; in those cases where rev. 5 of the STI-standard is explicitly required, the rev. 5 STIPA signal must be used. When measuring to requirements and/or standards drafted before 2018, the rev. 4 signal is the most suitable choice. In all other cases, both signals are most likely acceptable. In the majority of practical situations, the difference in measured STI-value is small to negligible.

Note that the VOXBOX is compatible with any STIPA analyzer that complies with IEC-60268-16 rev.4 or higher. We recommend a minimum duration of 18s for each individual STIPA test.

4.3. Full STI measurements

The Speech Transmission Index is originally based on a Modulation Transfer Function matrix (MTF) comprising 7 octave bands and 14 modulation frequencies (98 values in total). STIPA is a simplified version, featuring only 2 modulation frequencies per octave band. This has been shown sufficiently accurate for Public Address systems, and most other applications for that matter, but “Full STI” measurements may still be needed to get accurate results in highly complex environments (for example, environments that feature discrete echoes).

The original Full STI method, which has not been available as part of commercially available measuring instruments since the 1990s, dealt with each of the 98 octave-band/modulation-frequency combinations individually. This meant that a single measurement took up to 15 minutes to complete. A novel approach, now implemented in the VOX-01, uses a STIPA-like approach to reduce the measurement time to approx. 1 minute.

This novel Full STI approach, as implemented on the VOXBOX, is similar to STIPA in the sense that it also simultaneously considers two modulation frequencies per octave band. However, each measurement consists of 7 different stages, corresponding to 7 different segments of test signal. A rotation scheme is adopted that applies different modulation frequencies in each band during different phases of the measurement, ending up with a completely filled MTF matrix at the end of the measurement cycle.

The Full STI signal is played back continuously, in the same way as STIPA. The task of synchronizing to the different phases of the signal is performed by the STI analyzer.

Note that the Full STI signal currently works with all VOX-01 analyzers, but not necessarily with third-party analyzers. Although the Full STI implementation fully complies with IEC-60268-16, the underlying technology is proprietary; vendors of third-party analyzers will need to license the technology before implementing it. Before using the Full STI signal with third-party products, ensure that these are fully compatible and certified by Embedded Acoustics BV.

Also note that the Full STI signal is copyrighted and watermarked. With the purchase of the VOXBOX, a non-transferable perpetual licence is acquired to use the Full STI signal on all projects and for all STI-measuring needs that the VOXBOX owner may have, both personally and professionally, also for all those employed by the owner of the VOXBOX. However, this license explicitly excludes the rights to sublicense, to distribute, or to embed the signal in third-party equipment.

5. Noise, sine waves and sweeps

5.1 Noise

The VOXBOX offers two kinds of noise: pink noise and white noise. Pink noise has a flat spectrum on a logarithmic scale (equal energy per octave band), whereas white noise has a flat spectrum on a linear scale (equal energy per FFT bin). Given the logarithmic characteristics of frequency resolution of the human ear, this means that white noise perceptually emphasizes the higher frequencies.

The noise signals can be useful (among many other applications) in the following scenarios:

- Quickly assessing the frequency transfer function of a system. On a real-time analyzer, the pink noise signal will show a flat spectrum (equal in each 1/1 or 1/3 octave band). Any deviation from the flat spectrum reflects frequency-dependent behavior of the transmission channel between the VOXBOX and the analyzer
- Measuring the reverberation time (RT60) by means of the interrupted noise method. The VOXBOX can be used as a noise source, although especially in larger rooms a secondary high-power loudspeaker will be needed to achieve a sufficiently high sound pressure level. Upon switching of the noise source, the decay curve can be estimated.
- The VOXBOX can be used as a source of interfering noise (simulating background noise) in speech intelligibility studies.

5.2 Sine waves

Sine waves (pure tones) are available for each of the ISO-standardized octave frequencies from 125 Hz to 8 kHz. These can be used for measuring pure-tone response, dynamic range and distortion.

5.3 Sweep

Under the “sine” signal tab, the last signal (“sweep”) is a 14 second logarithmic sweep, covering the whole audible frequency rang from 20 Hz to 20 kHz. Note that the VOXBOX is not able to produce the lowest and highest frequencies within the sweep’s range, but these will be present in the line out signal. This sweep can be used for measuring the frequency transfer of loudspeakers and rooms, through convolution with the inverse sweep. Third-party software tools need to be used for the convolution process.

6. Speech recordings

The VOXBOX currently features six languages: US English, UK English, French, German, Spanish and Dutch. For each language, speech has been recorded for a male as well as a female talker. Translations of the same two messages are available for each talker:

English
"Attention. Within a few moments, a test of the sound system will begin. You may hear test signals being played, such as tones and noise. No action on your part is required. Thank you for understanding."
"Attention. End of sound system test. Thank you for your cooperation"

German
"Achtung: In wenigen Augenblicken wird die Lautsprecheranlage getestet. Dabei hören Sie möglicherweise Testsignale, zum Beispiel Tonsignale und ein Rauschen. Sie müssen dann nichts unternehmen. Vielen Dank für Ihr Verständnis."
"Achtung: Der Test ist beendet. Vielen Dank für Ihre Mitwirkung."

French
« Attention. Le système de sonorisation et d'information sera testé dans quelques instants. Il se peut que vous entendiez des signaux de test, tels que des signaux de tonalité et des bruits légers. Il n'est pas nécessaire d'y prêter attention. Merci de votre compréhension »
« Attention. Fin du test. Merci de votre collaboration. »

Spanish
"Atención. En unos instantes se procederá a probar el sistema de megafonía. Es posible que escuche señales de prueba, como señales de tono y ruidos de fondo. No es necesario tomar ninguna medida. Gracias por su comprensión"
"Atención. Final de la prueba. Gracias por su colaboración."

Dutch
"Attentie. Binnen enkele ogenblikken wordt het omroepsysteem getest. Mogelijk hoort u hierbij testsignalen, zoals toonsignalen en ruis. U hoeft hierop geen actie te ondernemen. Dank u voor uw begrip"
"Attentie. Einde van de test. Dank u voor uw medewerking."

These sentences may be used to announce the beginning and end of test sessions, but also to determine the speech level.

Note that there is an option in the calibration menu to toggle between looped speech playback and one-time only playback of each recording.

7. Calibration and accuracy

The frequency transfer function and sensitivity is measured individually for each VOXBOX at the factory. Before the start of the calibration process, a 15-hour “burn in” cycle is carried out to improve the stability of the loudspeaker. Based on these measurements, the signals played back by the VOXBOX are amplified and equalized to accurately match the intended level and spectrum.

7.1. Factory re-calibration

Note that excessive shocks and vibration may alter the characteristics of the VOXBOX. Always check your VOXBOX if you suspect that it has been dropped or manhandled. When in doubt, return to the factory for a check-up and recalibration. We recommend that each VOXBOX is checked and factory-calibrated at least once every 24 months.

7.2. Level calibration

The VOXBOX is designed and calibrated to accurately match the chosen signal level at 1 meter distance with a deviation of no more than +/- 0.5 dB. Note that this is the level under anechoic conditions; in a real-life environment, reverberation is likely to contribute somewhat to the overall level at 1 meter distance.

The distance is measured relative to the reference plane (loudspeaker grille). Although we follow the convention in specifying the level at 1 meter distance, calibration measurements for the VOXBOX actually take place at 0.25m distance, under the assumption of spherical radiation. The default level of 60 dB at 1.00 meter corresponds with 72 dB(A) at 0.25m.

7.3. Spectral calibration

The requirement in terms of the frequency transfer function is that no individual 1/3 octave band in the range from 80 Hz to 16 kHz may deviate more than 1 dB from the target level for that band. This is only achievable through an equalization process that counteracts the natural frequency-dependent characteristics of the loudspeaker. The “inverse filter” to compensate for the loudspeaker transfer differs between individual devices, and has to be measured independently.

The frequency characteristics as well as the characteristics of the inverse filter for each individual VOXBOX are printed on the calibration certificate that is supplied with the VOXBOX.

8. Cleaning and maintenance

No further maintenance is needed beyond normal superficial cleaning. We recommend that you clean the instrument with a soft cloth. LCD display cleaner can be used to clean the touch screen, provided that the following precautions are taken:

- Do not spray cleaner directly onto the display or into the loudspeaker grille
- Only use cleaning liquids specifically intended for LCD screens

Do not remove the hologram seal at the bottom of the device; this voids your warranty.

Never open the device. Note that any changes on the interior of the box (including the placement of the internal acoustic foam) may have an impact on the frequency transfer of the device. If you suspect that your VOXBOX needs repairs or maintenance, contact us at: service@sdifire.com.

9. Product warranty

The device is covered by a full-service, worldwide pick-up & return warranty until 24 months after the date of purchase. Please direct all warranty claims to:

SDi Fire
3535 Route 66, Building 6
Neptune, N 07753
service@sdifire.com

Please email us and wait for our response (typically within a business day) before shipping your hardware back. We may ask you to fill out an RMA form, and we will supply you with a reference number for your warranty claim. If you can provide a complete statement of the problems you are experiencing, this will help us solve your hardware issues as soon as possible. Always provide the ID number of your device (found on the bar code label on the back of the device), your name and address, and your date of purchase. If you did not purchase directly from SDi, also include dated proof of your purchase.

In general, our warranty program covers all defects except for those resulting from accidents, misuse (including improper electrical connections) and improper maintenance. The following is explicitly excluded from product warranty:

- Any damage resulting from dropping, falling or excess vibration
- Any damage done by liquids, including damage resulting from excessive use of screen cleaning liquids
- Any damage resulting from incorrect electric connections to the device through external connectors
- Any damage done by power surges or overvoltage on the USB power supply and/or audio connector
- Any mechanical damages to the display caused by mechanical forces applied to the screen surface, such as scratches.
- Normal wear and tear

The following voids warranty:

- Repair attempts by an unauthorized party
- Removal of product stickers, tamper proof seals, bar codes or serial numbers
- Attempts to install firmware from any other source than the manufacturer, or firmware intended for a different device model.

Malfunctions that are found to result from any of the above conditions are not covered by warranty. Repairs will take place only at the expense of the owner. If claimed under warranty, an examination fee may be charged and transportation costs will be charged to the owner.

Please do not attempt to open your VOXBOX yourself, as there are no user-serviceable parts inside. If you do see a legitimate need to open the device yourself, please contact us at service@sdifire.com first, so we can discuss preserving your warranty rights. Please be aware that the product is protected by tamper-proof seals.

10. Firmware updates

There is currently no way for users to update the internal firmware of the VOXBOX themselves. This has to be done at the factory. Newer versions of the firmware (if available) are installed upon request, at no additional cost, when the VOXBOX is returned to the factory for periodic recalibration.

11. Technical specifications

Functionality	Playback of acoustic test signals via balanced XLR line-out and loudspeaker. Supported signals: STIPA, Full STI, sine waves (125 Hz - 8 kHz), log sweep, pink noise, white noise, speech (male/female, 6 languages: US English, UK English, French, German, Spanish, Dutch).
Standards compliance	IEC 60268-16 rev. 4 and rev. 5
Specs acoustic output	Output range (SPL @ 1 m): 54 dB(A) - 72 dB(A) Adjustable in 1 dB increments Frequency transfer flat within +/- dB from 80 Hz to 16 kHz within 1/3 octave band resolution.
Specs electric output	Output range: -30 dBU to -12 dBU Adjustable in 1 dB increments
Display	Resistive LCD touch screen 320x240 pixels, 65k colors Luminance typ. 250 Cd/m2 Durability: 100k finger slides, 1M taps
Environmental	Temperature: 5 -35°C (41-95F) Relative humidity: 0% - 95% (non-condensing)
Electromagnetic compatibility	Complies with EN 61326-1:2006 - EN 61326-1:2006 FCC part 15 compliant (class A device)
Mechanical specs	Size approx. 180 x 130 x 115 mm Weight 800g Rear-mounted tripod adapter Loudspeaker diameter 58 mm
Bundled items	Ruggedized waterproof carrying case, VOXBOX, power supply, int. power supply adapters (US, EU, UK, AU), calibration certificate

12. Troubleshooting

Problem	Possible cause	Solution
Display shows error messages (green or red text).	Error on display processor or in communication between DSP and display processor	If the problem persists, contact support.
Audio sounds distorted	Operating on line in jack Mild intermodulation distortion Loose parts/wires Loudspeaker malfunction	No calibration/EQ on line in jack. Please ensure that the signal level is within range. This is normal and does not affect STIPA or frequency transfer measurements Send to factory for check-up
No audio after pressing Play	Output muted	Check status of mute button
Speech playback is not looped (plays only once)	Looping is an optional setting in the calibration menu	Enter the calibration menu when the system boots to toggle between looped/unlooped audio playback
Display is not bright enough	Brightness turned to low	Adjust through calibration menu

testifire®

MULTI-STIMULUS DETECTOR TESTER

User Manual

detectortesters

testing technology from No Climb

www.testifire.com

testifire®
MULTI-STIMULUS DETECTOR TESTER

User Manual

Testifire 2000 illustrated

SIGNALING CLASSIFIED UL Multi-Detector Test Apparatus as to Verification of Detector Functional Operation Only 77TL

This manual provides information for the correct use of the ***testifire***® 1000 and 2000 series of detector testers including:

Testifire® 1000 Head Unit
Testifire® 1001 Testing Kit
Testifire® 6001 Testing Kit
Testifire® 9001 Testing Kit

Testifire® 2000 Head Unit
Testifire® 2001 Testing Kit
Testifire® 6201 Testing Kit
Testifire® 9201 Testing Kit

Replacement Capsules

TS3 Smoke Capsule
TC3 CO Capsule

Additional Items

Solo™ 760 Battery Baton™
Solo™ 726 Universal Fast Battery Charger
Solo™ 100 Telescope Pole
Solo™ 101 Extension Pole
Solo™ 200 Universal Detector Removal Tool
Solo™ 610 Protective Carrying / Storage Bag
Testifire® 25 Infrared Remote Control
Testifire® 100 RFID Bluetooth® Module*

A complete Product Selector of the Testifire components and kits is shown on page 36 of this User Manual.

For any additional information or technical support, please contact your local distributor, or visit the Testifire web site at: www.testifire.com

* Future option

detectortesters
testing technology from No Climb

Important Information

- **Read this User Manual completely before using your Testifire.**
- **Save this User Manual** - Save all safety and operational instructions for future reference.
- **Take note of the Warnings** - Read carefully and follow all warning labels on the product and those described in this User Manual.
- **Water and Moisture** - This product is designed for indoor use only and should not be subject to, or used in, a wet environment.
- **Servicing** - To make sure that your Testifire unit continues to perform as intended, it will require a regular service. A standard period for service is every 12 months. In extreme use, a service could be required sooner. Testifire has a built-in service interval timer and it will warn you when a service is due or overdue. (See section 7.5 for more information).
- Testifire is a precision electronic instrument and care should be taken when handling and storing. Dropping on to a hard surface could damage it. Please look after it, treat it with care and it will last for many years.
- To protect the high-precision technology contained in Testifire, never leave Testifire in the places listed below, whether if in use or in storage:
    - Places where temperatures and/or humidity are high or go through extreme changes. Direct sunlight, or near other heat sources (stoves, radiators, etc.) Always observe the operating and storage environment restrictions detailed in the Technical Specifications (see Section 9)
    - In sandy or dusty environments.
    - In places prone to strong vibration.
    - Near to sources of static or radio waves.
    - Wet or moist environments. Testifire is designed for indoor use only.
- Stop using Testifire immediately if you notice any unusual odours; liquids or noise coming from it. Switch off immediately and consult technical support (section 7.1).
- If your Testifire unit becomes damaged do not use it. Switch off immediately and consult technical support (section 7.1).
- Testifire is not designed for use in hazardous areas (those containing explosive vapour or dust).
- Use only approved accessories that are recommended by the manufacturer for your Testifire model.
- The Battery Baton should be removed when Testifire is not in use. This will prevent the gradual discharge of the battery and prevent possible accidental operation of the head unit.
- Do not use your Testifire if it is not operating properly. Consult the Troubleshooting section (section 6.0) of this manual and if required seek technical advice.
- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
- Use only approved accessories that are recommended by the manufacturer for your Testifire model. (see Section 9.1)

Meanings of Symbols and Terms

The following symbols are used throughout this User Manual.

	This symbol on the product indicates that there is a safety hazard. You must read the appropriate sections of the User Manual to understand the nature and severity of all the potential hazards present and the action you must take.
	This symbol on the product indicates that you should read and understand this User Manual before using this product.
	This symbol on the product warns you of hot surfaces or heat by convection.
	This symbol on the product indicates that this part of the device is susceptible to static damage.
	The crossed-out refuse container symbol on this product or literature indicates that it should not be disposed with other business waste at the end of its working life. To help ensure that valuable resources are reused and recycled, and to prevent possible harm to the environment or human health from uncontrolled waste disposal, please separate this from any other types of waste.

General Safety Information

CAUTION

This product is intended to be used at height.

Exercise great care and always wear appropriate PPE (personal protective equipment) when operating above head height in order to avoid the risk of injury.

DO NOT OVER REACH. Keep proper footing and balance at all times. Proper footing and balance enables better control of the equipment in unexpected situations.

Pay particular attention to avoid contact with overhead items such as light fittings, overhead power cables/busbars and any other objects that could be accidentally dislodged which might cause danger to the operator or anyone else in the vicinity.

CAUTION

This product contains hot surfaces and hot air is also emitted from the duct outlet.

DO NOT TOUCH the tip of the CO capsule when it has been removed if the unit has been in operation within the previous 5 minutes. It will be very hot immediately after use and may burn if touched.

DO NOT insert fingers into the aperture from where the CO capsule has been removed. There are very hot surfaces which may burn if touched.

Avoid placing hands near the duct outlet during heat testing or within 5 minutes of conducting heat testing.

Hot air is emitted from the duct and the top of the duct will get hot to the touch.

WARNING

This product emits small amounts of carbon monoxide (CO) gas which is a harmful, odourless gas.

DO NOT INHALE directly from the duct during a CO test or within 5 minutes of conducting a CO test.

Note: Under normal operating conditions, this emission will present no harm to the user. For additional information please refer to the separate safety information provided.

Table of Contents

* Future option

1. General Instructions

1.1 Warranty

In addition to any other express warranty given in writing by the Company in relation to the Goods, the Company warrants that the Goods supplied under these terms and conditions will be in accordance with the specification (if any) contained in the Purchase Order, and will be free from defects in workmanship and material for a period of 18 months from the date of delivery to the Buyer or for a period of 12 months after the date of sale by the Buyer to the final customer whichever period is the shorter.

1.2 Acknowledgement

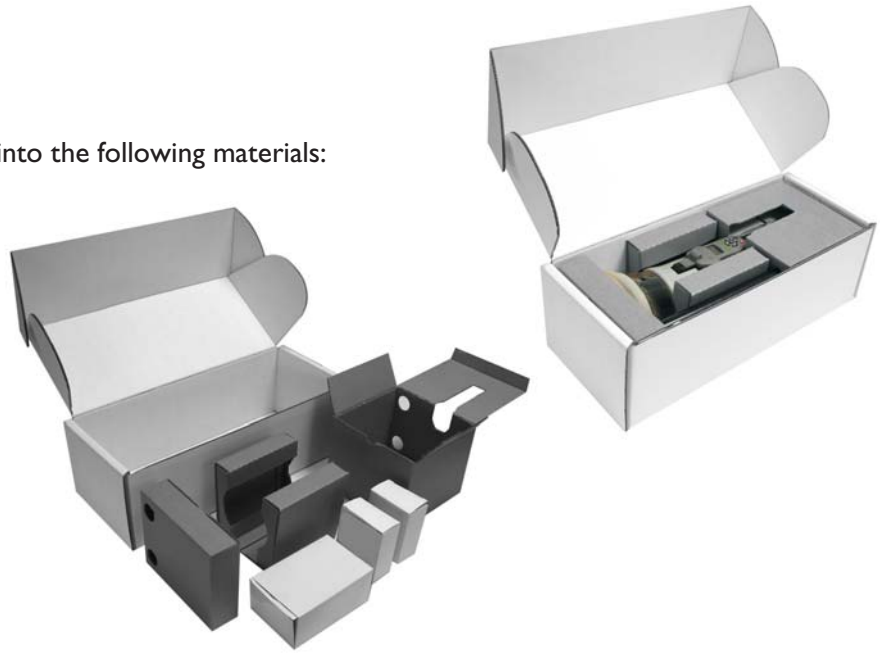
Testifire®, ***Solo***™ ***and Battery Baton***™ are registered marks of **No Climb Products Ltd**. All other brand names mentioned are trademarks or registered marks of their respective holders, and are hereby acknowledged.

1.3 Recycling

The packaging can be easily separated into the following materials:

- Cardboard (outer box)
- Cardboard (inner buffers, boxes)
- Polyethylene (Capsule bags)
- Plastic (Capsule caps)

Please dispose in line with local environmental requirements.



WEEE (Waste Electrical & Electronic Equipment) Regulations 2006

Testifire and Testifire capsules are suitably marked to be recycled in accordance with your local environmental requirements. Alternatively these items may be returned to the manufacturer via your reseller for disposal in compliance with WEEE (Waste Electrical & Electronic Equipment) Regulations 2006.

RoHS Declaration

We declare that this product and its associated components are designed and manufactured to be fully compliant with the requirements of the Directive 2002/95/EC Restrictions of use of certain Hazardous Substances in Electrical and Electronic Equipment (The RoHS Directive).

EULA (End User Licence Agreement)

See Section 10.

2. Introduction

Thank you for purchasing Testifire Multi-Stimulus Detector Tester.

This manual is designed to assist you to get the best and most efficient use of the Testifire 1000 and 2000 model range, and provides all the information required to perform routine service and maintenance tasks with ease.

Testifire includes an array of advanced and intelligent technologies that change traditional approaches to functional testing in the field. Simply by being able to test all fire detectors with one unit is faster and more productive. In addition the Testifire range brings health, safety, environmental and technological benefits to field servicing of fire detectors as never seen before.

Testifire is a technologically advanced, fully field portable device for functional testing of fire detectors. The unit is suitable for testing optical/photoelectric and ionisation smoke sensors, thermal sensors (fixed temperature or rate-of-rise), and carbon monoxide (CO) fire sensors, be they conventional, addressable or analogue addressable. Testifire is also the first functional tester that enables testing of multi-sensors or multi-criteria detectors from a single test unit.

Testifire creates stimuli that the sensors are designed to detect. Depending on the model purchased, Testifire can create smoke, heat and CO stimuli on demand from a single unit. Testifire creates stimuli without using pressurised aerosol cans or hazardous media. Stimuli (Smoke, Heat, and CO) are generated at the time of test using safe and patented processes fuelled by replaceable capsules.

Testifire can also execute programmed testing: Simultaneously (any combination of Smoke, Heat and CO), Sequentially (e.g. Smoke, followed by Heat and then CO) or Combined Simultaneous and Sequentially (e.g. Smoke and Heat together followed by CO). In addition it also incorporates a clearing mode that enables the stimuli to be blown out of the detector immediately after a test, enabling more rapid resets at the panel.

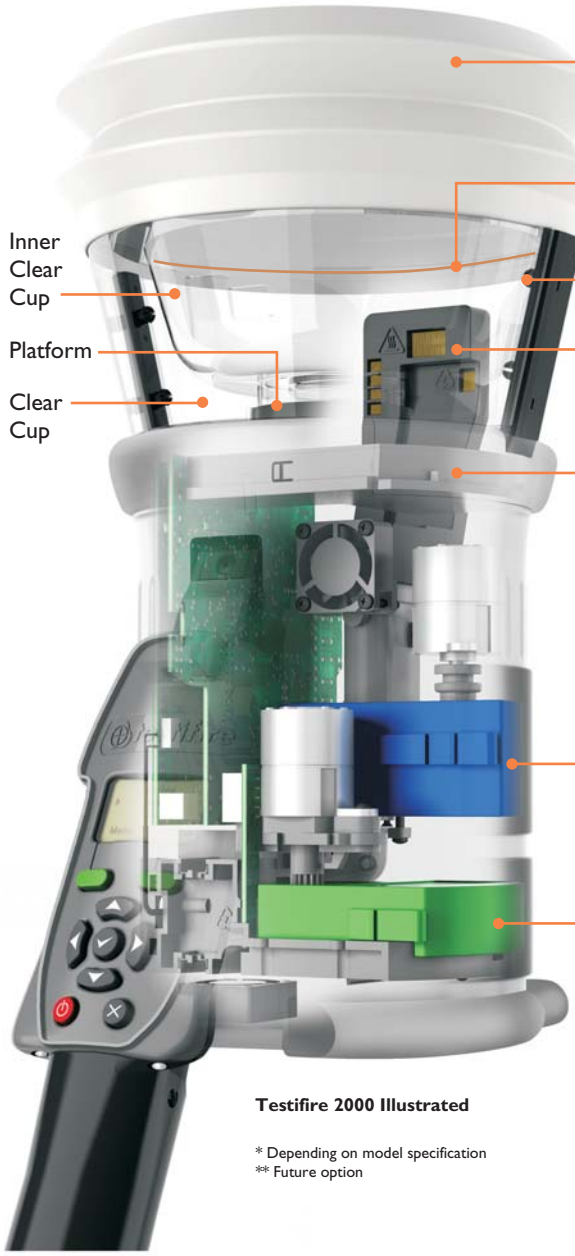
Testifire is also capable of reading from, and writing data to electronic RFID tags which may be installed on detectors. This permits a level of automation in testing and logging of service and maintenance activities. The facility for an optional RFID and Bluetooth® module is covered in detail in the RFID manual.

If you require additional information or assistance in the use of Testifire, please visit the support area of our web site, or contact our technical support department as detailed on the Support page of this User Manual.

Testifire 1000 Series Head Unit

Testifire 2000 Series Head Unit

3. Parts Identification

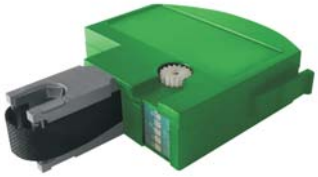


Testifire 2000 Illustrated

* Depending on model specification
** Future option

Replacement Capsules

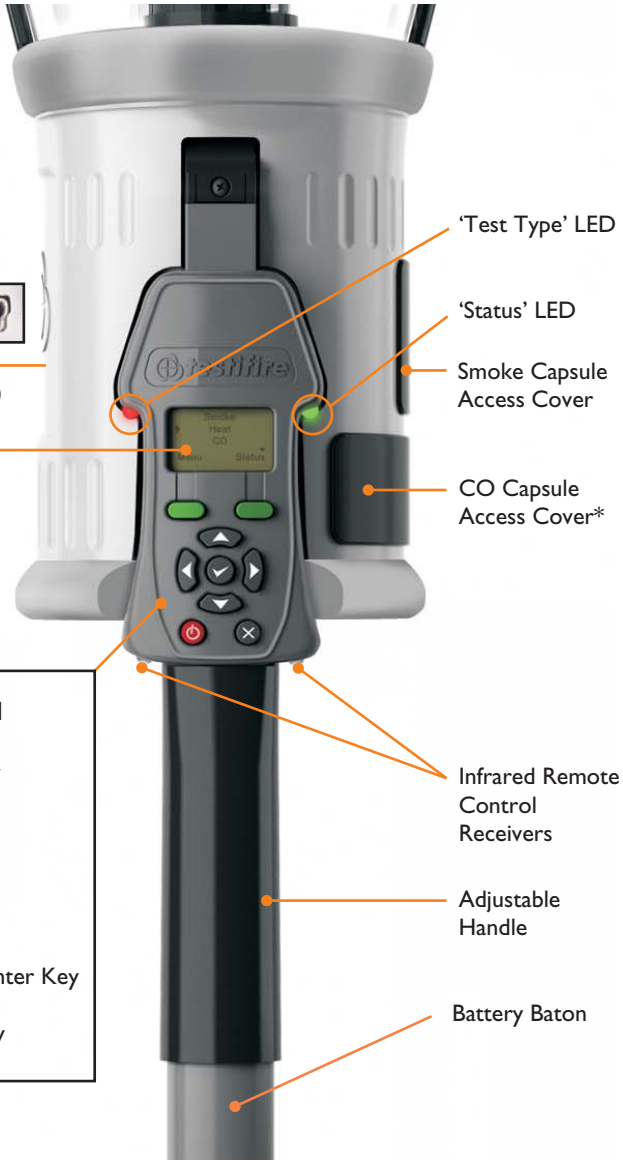
Testifire Smoke Capsule TS3



Testifire CO Capsule TC3*

USB Port (on rear of unit)

User Interface Display (LCD)



User Interface Keypad

4. Preparation For Use

4.1 Charging the Battery

WARNING

Do not attempt to use or charge the battery if either the unit or the battery connection point are damaged.

Never connect AC and DC power at the same time.

- Solo NiMH Battery Batons are used to power Testifire and enable it to be fitted to Solo Access Poles.
- The Solo 760 Battery Baton must be charged before using Testifire. To obtain maximum duration of testing and to preserve the life of the batteries, they must be fully charged before the first use. Only the Solo 725 charger should be used for charging Solo 760 Battery Batons (Fig. 1).

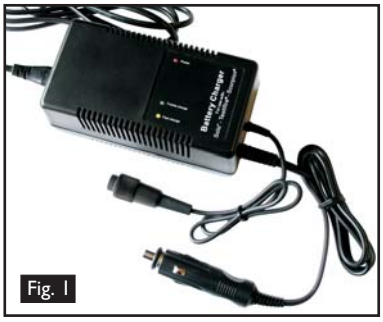


Fig. 1

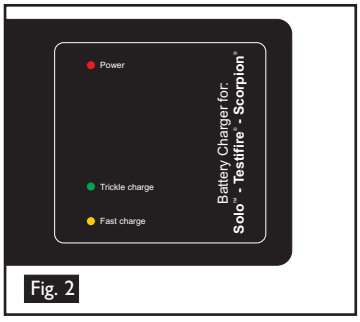


Fig. 2

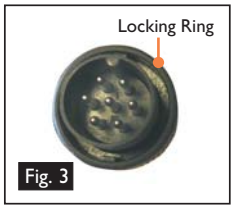


Fig. 3

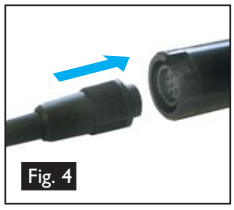


Fig. 4

- The Solo 725 charger can be connected to a mains power outlet or 12 volt vehicle accessory socket.
- Once connected to either mains power or 12 volt supply, the red power indicating LED will illuminate (Fig. 2).
- Connect the Battery Baton to the charger via the seven pin polarised connector and turn the locking ring (Fig. 3 & 4).
- Once the Battery Baton has been connected, the yellow Fast Charge LED will illuminate (Fig. 2).
- Charging times will depend on the discharge state of the Battery Baton. Charge times can be 75-90 minutes when charging a fully discharged Battery Baton.
- When the Battery Baton reaches a fully charged state, the Solo 725 charger will automatically switch to Trickle Charge. The yellow Fast Charge LED will go out and the green Trickle Charge LED will illuminate.

NOTE: If Battery Baton is not to be used for sometime (i.e. within the next day), it is advisable to unplug the charger from the power supply.

- To stop charging disconnect the power plug before removing the Battery Baton from the charger.
- As with all rechargeable batteries, after a few hundred cycles of normal use your Battery Baton will eventually reach the end of its useable life and will hold less charge or not charge properly. At this point it is recommended that replacement Battery Batons are purchased.
- Whenever possible, discharge the Battery Baton fully before charging - this will ensure the longest possible battery life.

CAUTION

Store charger in a dry place (indoor use only when connected to AC mains). Danger of fire and electric shock! Do not fast-charge a hot battery, allow the Battery Baton to cool down naturally before starting a charge cycle. Allow the charger to cool down for at least 15 minutes after one fast charge. Stop charging if the Battery Baton becomes too hot during charging (>55-60°C). Do not leave unattended whilst charging. Only clean with a dry cloth. Do not attempt to open the charger. Repair permitted only by authorised dealer.

Battery Batons must be stored and charged in accordance with stated environmental conditions.

Environment: Operating temperature:5°C to 45°C / 40°F to 115°F
Storage temperature: -10°C to 50°C / 15°F to 120°F
Humidity:0-90% RH non-condensing

ATTENTION

This charger is designed for charging fast rechargeable NiMH Battery Batons (Solo 760) only. Do not connect other types of batteries. Danger of explosion.

ENVIRONMENT

Battery Batons must be disposed of at a recognised recycling centre. Local authorities can provide advice on the best method.

4.2 Using the Battery

CAUTION

Ensure correct orientation when inserting Battery Baton into tool and do not use undue force to insert.

Remove Battery Baton from Testifire when not in use.

- To insert the Battery Baton into Testifire, hold the Testifire head unit by the handle and depress the upper spring button on the Battery Baton. Align the button with the location hole in the handle and push the Battery Baton into the handle until the button springs up through the location hole (Fig. 5).

TIP: Slight rotation of the Battery Baton may assist alignment when inserting.

- Insert the other end of the Battery Baton into the Solo access pole and depress the lower spring button. Align it with the location hole and push the Battery Baton further into the pole until the button springs up through the hole (Fig. 6).

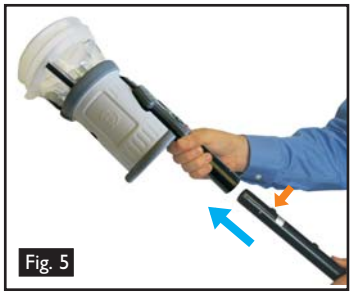


Fig. 5


Fig. 6

4.3 Removal and Replacement of the Smoke and Carbon Monoxide (CO) Capsules

	**CAUTION** This symbol on the product indicates that this part of the device is susceptible to static damage. ***DO NOT TOUCH*** the contacts on the PCB on the capsule. Static electricity may damage them and contamination of the contacts must be avoided.
	**CAUTION** ***DO NOT TOUCH*** the black carbon tape of the CO capsule or surrounding area. The tip and surrounding area may be hot after use.
	**CAUTION** ***DO NOT*** insert fingers or other objects into the aperture from where the CO capsule has been removed. There are very hot surfaces which may burn or become damaged if touched.

Smoke and CO capsules are non-refillable. Only replace with genuine Testifire TS3 (Smoke) and TC3 (CO) Capsules.

Note: Manufacturer's warranty is conditional on the use of only genuine Testifire replacement parts which must be replaced in accordance with the instructions supplied.

Please observe the local regulations regarding the disposal of packaging materials, exhausted batteries and old electronic equipment.

Empty capsules may be returned to the manufacturer for environmentally-friendly disposal via the reseller to comply with WEEE (Waste Electrical & Electronic Equipment) Regulations 2006.

Only use gentle pressure when inserting the capsules.

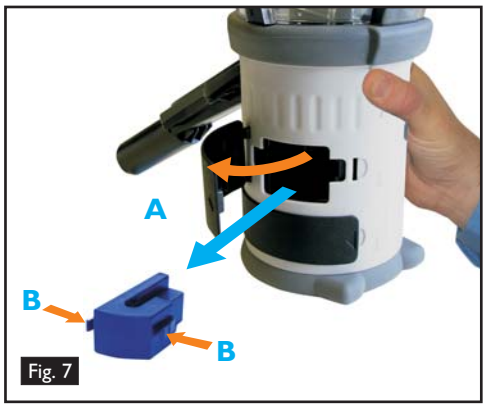


Fig. 7

Smoke Capsule Removal Instructions (Testifire 1000 and 2000 series)

- Release the upper access cover **A** (Fig. 7) on the body of the Testifire unit by opening it from the right hand side. **Note:** Testifire 1000 series units only have one access cover.
- Squeeze the two clips **B** (Fig. 7) on each side of the used capsule and gently pull the capsule out.

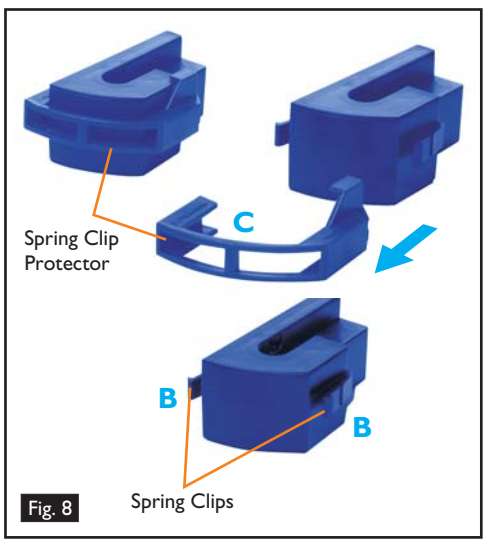


Fig. 8

Smoke Capsule Replacement Instructions

- Remove the capsule from its outer carton and anti-static bag.
- Remove the spring clip protector cap **C** (Fig. 8) from the new capsule.
- Holding the capsule by the spring clips **B** (Fig. 8) with the label on the underside, carefully insert the new capsule into the capsule port. Push it into position, ensuring that the clips spring out positively on both sides of the capsule to engage correctly with the port.
- Close the Smoke access cover **A** (Fig. 7) securely.

CO Capsule Removal Instructions (Testifire 2000 series only)

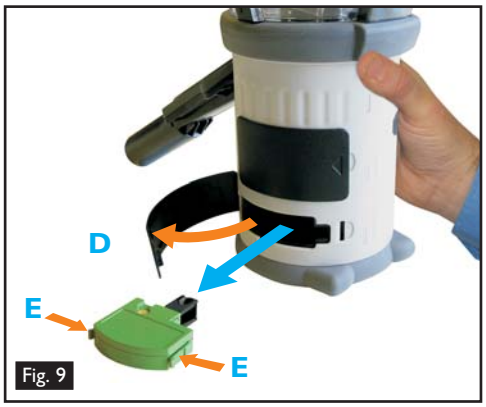


Fig. 9

- Only replace the CO capsule when it is empty. Testifire should be turned off for five minutes to allow the 'CO' capsule to cool down before removing it.
- Release the lower access cover **D** (Fig. 9) on the body of the Testifire unit by opening it from the right hand side.
- Squeeze the spring clips **E** (Fig. 9)on each side and gently pull the capsule out.
- Do not touch the tip of the CO capsule as it may be hot.

CO Capsule Replacement Instructions

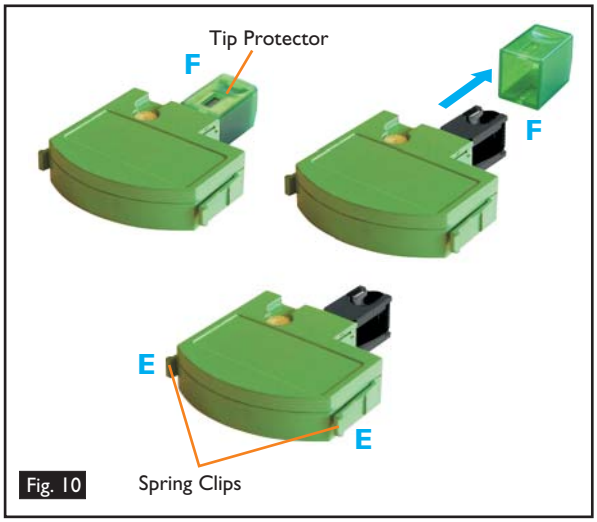


Fig. 10

- Remove the capsule from its outer carton and anti-static bag.
- Remove the tip protector from the tip of the capsule **F** (Fig. 10).
- Holding the capsule by the spring clips **E** (Fig. 10) with the label uppermost, carefully insert the new capsule into the capsule port. Push it into position, ensuring that the spring clips spring out positively on both sides of the capsule and engage with the port properly. Close the CO access cover **D** (Fig. 9) securely.

4.4 Turning the Unit On


Fig. 11

- To turn the unit on, press and hold the red 'ON-OFF' key ⏻ for 2 seconds (Fig. 11). The 'Status' LED will flash slowly green to indicate that the unit is in 'STANDBY' mode.
- The first time the unit is powered-on (or after a 'System Reset' see Section 6.2), you will be prompted to select the Testifire operating language for your region. Use the 'UP' and 'DOWN' keys ⇕ to navigate and 'ENTER' key ✔ to select your required operating language (Fig. 12).
- This will display a confirmation screen (Fig. 13). Press the 'MENU' key to select or the 'STATUS' key to cancel. Once the language has been selected the 'MAIN' menu will be displayed.
- The chosen language can be changed at any time by pressing the 'MENU' key. Use the 'UP' and 'DOWN' keys ⇕ to navigate the menu and use the 'ENTER' key ✔ to select 'Language' (Fig. 14). Pressing the 'ESCAPE' key ✖ goes back to the 'STANDBY' screen.
- After long periods of non-use or when a Smoke Capsule has been replaced, the unit will self-prime at power-on, prior to displaying the 'MAIN' menu. Testifire will show the 'Preparing for use Please wait' message for a short period while it is priming the circuits ready for use (Fig. 15).

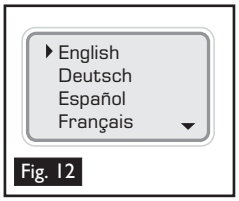


Fig. 12

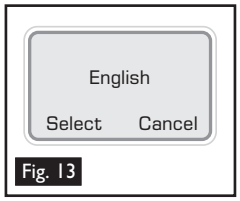


Fig. 13

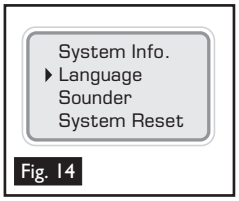


Fig. 14

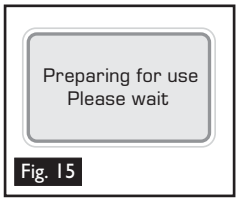


Fig. 15

- If the unit is left in Standby mode for more than 5 minutes, it will power off to conserve the battery.

4.5 Using the Menus

- Before turning Testifire on for the first time, it is recommended that you become familiar with system menus.
- Testifire's menu system is simple to navigate. Using the 'UP' and 'DOWN' menu navigation keys, you can move the cursor through the 'MAIN' menu (Fig. 16). Press the 'ENTER' key to select stimuli from the 'MAIN' menu or to display sub menus.
- Pressing the 'ESCAPE' key goes back to the 'MAIN' menu or, when a test sequence has been programmed and the 'MAIN' menu is displayed, the 'ESCAPE' key will cancel the programmed test sequence.
- A 'DOWN' arrow on the bottom right of the 'MAIN' menu indicates options are available below. Use the 'DOWN' key on the keypad to move down through the menu. (Fig. 17).
- The 'UP' arrow on the 'MAIN' menu indicates options available above. Use the 'UP' key on the keypad to move up through the menu (Fig 18).
- Press the 'LEFT' key on the keypad to go back one menu level.

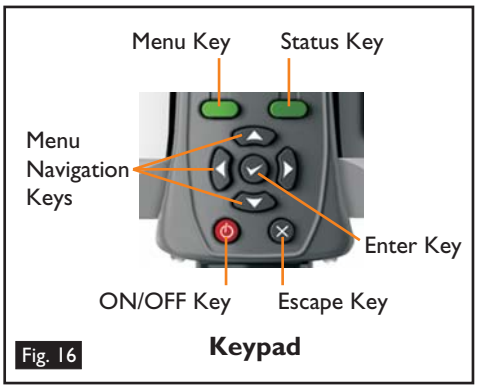


Fig. 16 **Keypad**

TIP: For a single test, use the 'UP' and 'DOWN' keys to highlight 'Smoke', 'Heat' or 'CO' as required on the 'MAIN' menu. You do not need to press the 'ENTER' key on the keypad to select, just leave the required test stimuli highlighted (Fig. 19).

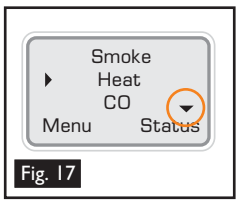


Fig. 17

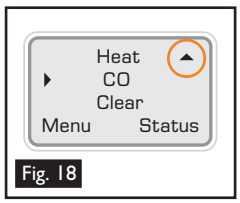


Fig. 18

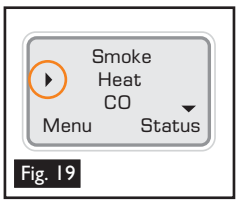


Fig. 19

4.6 Adjusting the Head Unit Angle

- Correct head angle adjustment is important to make sure that the detector to be tested is correctly positioned in the inner clear cup and the user is in a safe and appropriate position to carry out the test. The detector should touch the base of the Testifire inner clear cup and should be level with the base of the detector (Fig. 20).

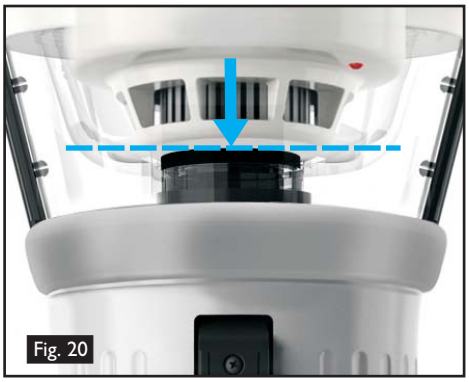


Fig. 20

- Adjust the head unit for the correct angle to access the detector to be tested. Hold the body of Testifire and, pulling gently against the spring, angle the head unit away from the Battery Baton (Fig. 21). The head unit will be free to rotate to the desired position and, on release, it will lock and remain locked for use (Fig. 22).


Fig. 21


Fig. 22

4.7 Testing High Profile Detectors

- When testing high profile detectors, it may be necessary to remove the inner clear cup to enable the detector to sit in the correct position for a successful test. The inner clear cup has a semi-circular cut-out on the side nearest to the user interface. Place your finger in the cut-out and carefully lift out the cup (Fig. 23). This will allow for correct positioning of the high profile detector within the cup (Fig. 24).


Fig. 23


Fig. 24

TIP: To prevent Testifire going straight into a test mode, both the inner and outer clear cups should cleaned regularly with a damp non-abrasive cloth to remove any deposits or finger marks.

5. Using Your Testifire

CAUTION

This product is intended to be used at height.

Exercise great care and always wear appropriate PPE (personal protective equipment) when operating above head height in order to avoid the risk of injury.

DO NOT OVER REACH. Keep proper footing and balance at all times. Proper footing and balance enables better control of the equipment in unexpected situations.

Care should always be taken when using Testifire at height. Pay particular attention to avoid contact with overhead items such as light fittings, overhead power cables/busbars and any other objects that could be accidentally dislodged which might cause danger to the operator or anyone else in the vicinity.

CAUTION

This product contains hot surfaces and hot air is also emitted from the duct outlet.

DO NOT TOUCH the tip of the CO capsule when it has been removed if the unit has been in operation within the previous 5 minutes. It will be very hot immediately after use and may burn if touched.

DO NOT insert fingers into the aperture from where the CO capsule has been removed. There are very hot surfaces which may burn if touched.

Avoid placing hands near the duct outlet during heat testing or within 5 minutes of conducting heat testing. Hot air is emitted from the duct and the top of the duct will get hot to the touch.

WARNING

This product emits small amounts of carbon monoxide (CO) gas which is a harmful, odourless gas.

DO NOT INHALE directly from the duct during a CO test or within 5 minutes of conducting a CO test.

Note: Under normal operating conditions, this emission will present no harm to the user. For additional information please refer to the separate safety information provided.

- After you have completed the preparation procedures, Testifire will be ready for use.
- To carry out a simple, single stimulus test, use the 'UP' and 'DOWN' keys on the keypad (as described in section 4.4 of this manual) to highlight the stimulus required (Fig. 25). Although you can select the required stimulus by pressing the 'ENTER' key, all that is required for a single stimulus test is to highlight the required stimulus (complex sequences of single-stimulus tests, or a simultaneous multi-stimulus test are covered in Sections 5.8, 5.9 and 5.10).

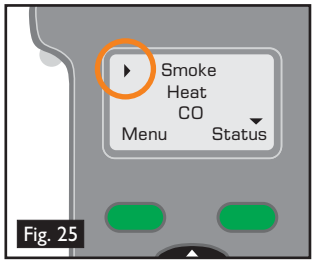


Fig. 25

- Once the stimulus has been selected, the 'Test Type' LED will change colour to indicate the following:

Red = Heat Test Blue = Smoke Test Green = Carbon Monoxide Test Clear = Clearing

- The 'Status' LED provides feedback on the modes of operation and alerts you to errors or when a smoke or CO capsule is empty or incorrectly fitted. The Indicating LED Reference Chart details all of the variations (see Section 5.13).

5.1 Sounder Option

- Two different 'beeps' are emitted from Testifire. A short 'beep' when pressing the 'Power-On' button and for a key press ('Keypad'), and a longer 2-second 'beep' for errors ('Warning').

- In some environments the sound may not be desirable. Testifire has an option that allows both types of 'beep' to be disabled. Once disabled, the sound stays disabled until it is manually enabled again or a 'SYSTEM RESET' takes place. (see Section 6.2).

- To disable the sound, press the 'MENU' key and using the 'UP' and 'DOWN' keys on the keypad, navigate to 'Sounder' (Fig. 26) and select using the 'ENTER' key . Use the 'ENTER' key also to select 'ON' or 'OFF' for the 'Keypad' and 'Warning' sounds (Fig. 27).

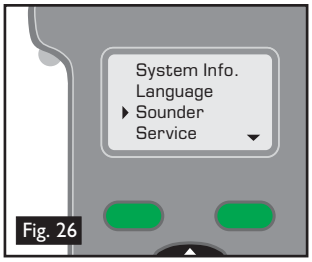


Fig. 26

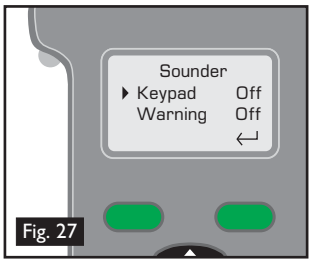


Fig. 27

5.2 Testing a Detector

- Raise Testifire up to the detector to be tested and place it centrally over the detector. As the detector enters the clear cup and interrupts the built-in infrared sensor in the head of Testifire, the selected tests or sequence of tests, begin.

  NOTE: It is very important that the detector under test is in the correct position within the clear cup for a successful test to take place. The detector should sit on the platform and the top of the inner clear cup should be parallel to the detector base. Ideally, the bellows should seal against the ceiling surface (Fig 28).


Fig. 28

- When testing high profile detectors, it may be necessary to remove the inner clear cup to enable the detector to sit in the correct position for a successful test. The inner clear cup has a semi-circular cut-out on the side nearest to the user interface. Place your finger in the cut-out and carefully lift out the inner clear cup (Fig. 29).

  TIP: Ideally, the detector LED should be visible through the inner cup of the head unit. In some instances this is not possible. To improve visibility of the detector LED, lower Testifire briefly, (2 seconds maximum), raising it again to continue the test.


Fig. 29

- For single-stimulus tests, the 'Test Type' LED will remain illuminated in one colour only, and for a sequence of single-stimulus tests it will show the colour relating to the current test. For a multi-stimulus simultaneous test, it will show all the colours relating to the stimuli in the test, alternating its colour repeatedly between them.

- If after 2 minutes the test has not completed, Testifire will time out.

- When the detector is activated, remove Testifire by lowering it gently. Testifire will return to 'STANDBY' mode as the Infrared beam is re-established and the 'Status' LED will flash slowly again.

Testifire may be used in a variety of modes for detector testing. Multiple stimuli (Smoke, Heat, CO) may be tested either simultaneously (all at once) and/or sequentially (in various combinations). The stimuli and their method of operation are described in the following sections.

NOTE: Lowering Testifire during a test will do the following:

For less than 2 seconds:	Nothing. The test will continue as soon as the detector re-enters the cup.
For more than 2 seconds:	During a Sequential Test, Testifire will advance to the next test that is programmed.
For more than 10 seconds:	During a Sequential or Simultaneous Test, Testifire will reset and return to the first test of the programmed test sequence.

5.3 Smoke Testing

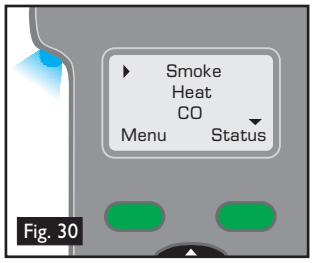


Fig. 30

- To select a smoke test on the 'MAIN' menu, move the cursor to 'Smoke' using the 'UP' and 'DOWN' keys on the keypad (Fig. 30). The test will begin automatically when the head unit is placed over the detector and the infrared beam is broken.
- The 'Test Type' LED on Testifire will confirm that smoke is being generated by illuminating blue.
- Smoke is generated and blown into the detector within a few seconds of the test beginning.
- Not all of the smoke is visible to the naked eye and it must not be assumed that there is a problem when smoke is not immediately seen emerging from the unit.
- The amount of smoke produced may vary throughout the test.
- During a smoke test, a slight 'popping' noise may be heard during the smoke generation. This is normal and part of the test procedure.

5.4 Heat Testing

CAUTION

Avoid placing hands near the duct outlet during heat testing or within 5 minutes of conducting heat testing.

Hot air is emitted from the duct and the top of the duct will get hot to the touch.

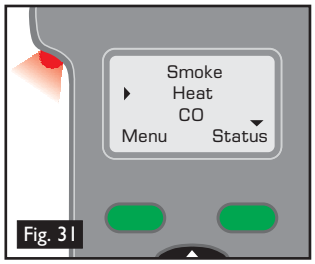


Fig. 31

- To select a heat test on the 'MAIN' menu, move the cursor to 'Heat' using the 'UP' and 'DOWN' keys on the keypad (Fig. 31). The test will begin automatically when the head unit is placed over the detector and the infrared beam is broken.
- The 'Test Type' LED on Testifire will confirm that heat is being generated by illuminating red.
- Heat is blown from the duct immediately the test begins. The temperature of the air emerging from the duct is such that it can heat the thermal sensor in the detector.
- The heat is produced in a narrow stream and is not intended to heat up the whole inner clear cup area of Testifire. Instead, only the area immediately around the thermal sensor in the detector will be heated in order to preserve battery power.

- A ‘Hi Heat’ setting for fixed temperature detectors which operate at more than 90°C (194°F) is available. It is recommended that for most tests the ‘Heat’ (normal heat) setting is used as this will conserve battery power.

- To select a ‘Hi Heat’ test, use the ‘UP’ and ‘DOWN’ keys on the keypad to highlight ‘Heat’. Press the ‘STATUS’ key on the keypad (Fig 32), and then move the cursor to ‘Hi Heat’ (Fig 33) using the ‘UP’ and ‘DOWN’ keys on the keypad. Press the ‘ENTER’ key to select ‘Hi-Heat’.


Fig. 32

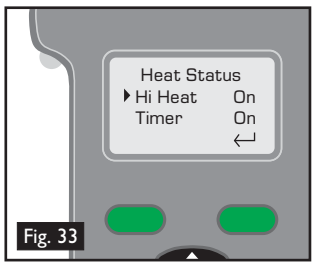


Fig. 33

- After selecting ‘Hi Heat’, Testifire will revert to the ‘Heat’ setting when the unit is switched off and on again.

Special Notes for Heat Detectors

- Heat detectors have a thermal sensor (normally a thermistor) that detects heat. This is usually mounted centrally within the detector which allows for easy alignment of Testifire. For heat detectors with either dual or offset thermistors, the main duct of the Testifire head unit should be aligned with the thermal sensor. Incorrect alignment could result in a failed test.

- If after 2 minutes the test has not completed, Testifire will timeout. When Testifire is lowered (re-establishing the Infrared beam) it will switch to ‘STANDBY’ mode, ready to carry out the next test. The ‘Status’ LED will flash slowly alternating between green and red for 3 seconds before reverting to slowly flashing green indicating ‘STANDBY’ mode. For tests started with the Infrared Remote Control, Testifire's timeout mode is different. The red-green flashing led timeout mode will only last for 10 seconds after which the test sequence will be cancelled and the unit will revert back to standby mode.

- When using the ‘Heat’ setting, care should also be taken not to leave the Testifire head unit in position over a detector for too long. The plastics used in some detectors with thermal sensing elements that respond to rate-of-rise, or reasonably low absolute temperatures, may soften if exposed to heat for long periods of time.

- Extra care should be taken not to overheat a detector when using the ‘Heat’ setting combined with ‘Smoke’ and/or ‘CO’ (two or more at the same time) as there may be a delay in response from the slowest sensor. This may mean that the heat has been applied for longer than necessary for the element of the detector to activate.

NFPA 72 - Heat Detector Testing

- To enable compliance with NFPA 72, a 60 second heat timer option is available. Selecting this option stops the heat test at 60 seconds as required by the standard. A ‘Timer’ option is available for ‘Heat’ and ‘Hi-Heat’ settings.

- To select the ‘Timer’ option, highlight ‘Heat’ or ‘Hi Heat’ on the ‘MAIN’ menu. Press the ‘STATUS’ key (Fig. 34), and move the cursor by using the ‘UP’ and ‘DOWN’ keys on the keypad to highlight ‘Timer’ on the menu (Fig. 35). Press the ‘ENTER’ key on the keypad to select. A countdown icon will appear on the ‘MAIN’ menu alongside ‘Heat’ or ‘Hi Heat’ (Fig. 36).

- Once the Timer option has been selected it will stay on until it is turned off manually or a ‘SYSTEM RESET’ takes place (see Section 6.2).


Fig. 34

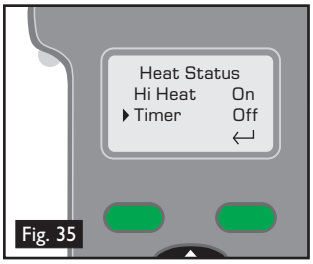


Fig. 35

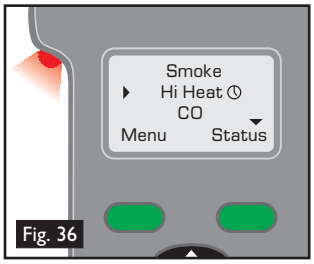


Fig. 36

5.5 Carbon Monoxide (CO) Testing

WARNING

This product emits small amounts of carbon monoxide (CO) gas which is a harmful, odourless gas.

DO NOT INHALE directly from the duct during a CO test or within 5 minutes of conducting a CO test.

Note: Under normal operating conditions, this emission will present no harm to the user. For additional information please refer to the separate safety information provided.

- To select a CO test on the 'MAIN' menu, move the cursor to 'CO' using the 'UP' and 'DOWN' keys on the keypad (Fig. 37). The test will begin automatically when the head unit is placed over the detector and the infrared beam is broken.
- CO is invisible and it will not be apparent that the gas is present during a test. The 'Test Type' LED on Testifire will confirm that CO is being generated by illuminating green.
- CO is generated and gently blown into the detector.
- When used as directed, Testifire is safe for testing CO Fire Detectors. It is not suitable for testing most Life Safety CO Detectors which typically require exposure to far higher level of carbon monoxide to activate.

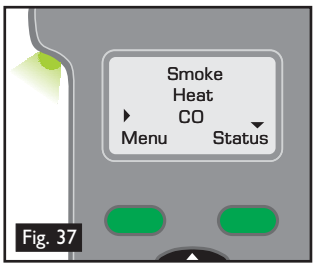


Fig. 37

- After carrying out a CO test (singularly or as part of a programme). Testifire cools the CO heater element. The right hand 'Status' LED will flash Green and Red with longer gaps between the flashes. Once the CO heater element temperature has been reduced, the 'Status' LED will indicate 'STANDBY' mode, by flashing Green slowly. The next CO test can then be carried out.

5.6 Clearing the Detector

- This operation blows air into the detector to clear it of smoke. It does not clean the internal components of the detector.
- To select the clearing function on the main menu, move the cursor to 'Clear' using the 'UP' and 'DOWN' keys on the keypad (Fig. 38). The clearing operation will begin automatically when the head unit is placed over the detector and the infrared beam is broken. The 'Status' LED will flash fast in green or fast in red if the battery is low.
- The 'Test Type' LED will not be illuminated at all during a clearing operation.

  TIP: Set 'Clear' as part of a sequential test with 'Smoke e.g. 'Smoke' is 1 and 'Clear' is set to 2 (Fig. 39). This will speed up the testing of smoke detectors as the clearing process will remove the possibility of the detector reactivating. See Section 5.9 for details of how to set up a sequential test.

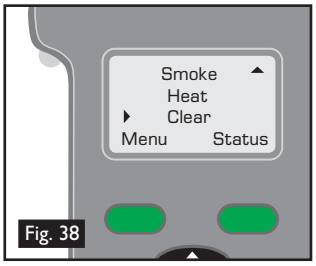


Fig. 38

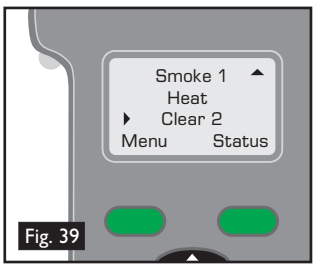


Fig. 39

5.7 Capsule Fuel Level

- The remaining level of 'Smoke' and 'CO' fuel available in the capsules can be displayed on the screen by highlighting 'Smoke' or 'CO' in the 'MAIN' menu by using the 'UP' and 'DOWN' keys on the keypad (Fig. 40) and then pressing the 'STATUS' key (Fig. 41) to display the capsule level (Fig. 42).

- Attempting to carry out a test with an empty capsule will result in an error. The 'Status' LED will illuminate red and 'Capsule Empty' will be displayed on the screen.

- If an 'X' is displayed beside 'Smoke' or 'CO' on the 'MAIN' menu it indicates that there is a problem with the capsule (Fig. 43). Either it is not installed, or it is installed incorrectly.

- If an '!' is displayed beside 'Smoke' or 'CO' it indicates that the capsule is nearly empty (Fig. 44). Make sure you have replacements available.

- If an '◿' is displayed beside 'Smoke' or 'CO' it indicates that the capsule is empty (Fig. 45) and requires replacement.

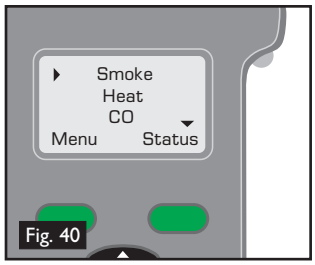


Fig. 40


Fig. 41

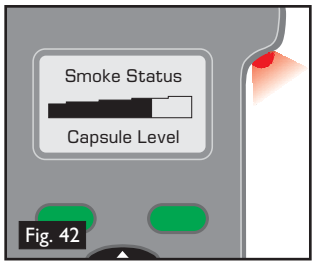


Fig. 42

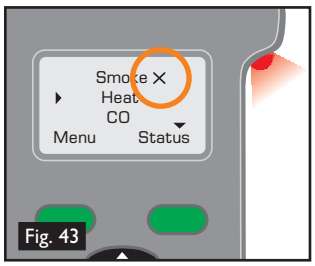


Fig. 43

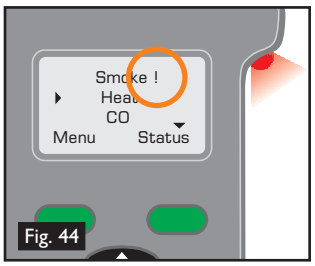


Fig. 44

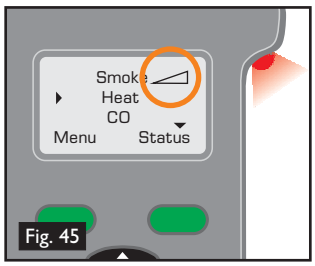


Fig. 45

5.8 Simultaneous Testing

Using Testifire to carry out a Simultaneous Test means that a number of operations (Smoke, Heat and CO) can be pre-programmed into the unit before it is raised up to the detector. This saves time, reduces handling and enables the testing of certain multi-sensor detectors if they are so enabled.

Note: Depending on the detection system being tested, there may be no individual indication of the activation of the separate sensors in the detector. The system may activate on one sensor only.

- A stimulus for a Simultaneous Test is programmed by moving the cursor to the desired test using the 'UP' and 'DOWN' keys on the keypad, and then pressing the 'ENTER' key to select that test (Fig. 46). It will appear with a number designation beside it on the LCD. After the first one (which will be designated '1') choose the second stimulus in the same manner and then press the 'ENTER' key a second time and its number designation will also change to '1'. Add the third stimulus in the same way if required, ensuring that the 'ENTER' key is pressed again until it displays '1' adjacent to that stimulus. When complete, all the required stimuli should have the designation '1' next to them. The 'Test Type' LED will show alternating colours according to the stimuli chosen (for details of these colours, see Section 5.13 of this manual). Fig. 47 illustrates the procedure for a Simultaneous Test (in this example for 'Smoke' and 'Heat' at the same time).

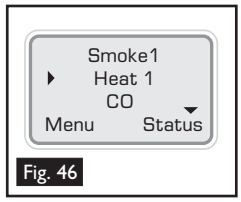
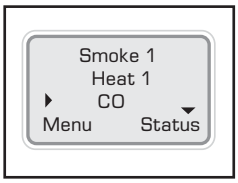


Fig. 46

- To delete a simultaneous test setup, use the 'ESCAPE' key .

1. Programme the tests:
Smoke 1
Heat 1



2. Raise Testifire over the detector:
'Smoke' and 'Heat' are tested at the same time in a Simultaneous Test.

3. Lower Testifire from the detector:
The test is completed and Testifire is ready to test another detector in the same way.

Fig. 47

5.9 Sequential Testing

Using Testifire to carry out a Sequential Test means that a number of operations (Smoke, Heat, CO and Clearing) can be pre-programmed into the unit before it is raised up to the detector. This saves time, reduces handling and enables the testing of certain multi-sensor detectors if they are so enabled.

- Any or all of the above test modes (Smoke, Heat, CO, Clearing or a Simultaneous Combination) can be programmed into a short test sequence of up to four elements.

- Sequences are programmed by moving the cursor to the desired test using the 'UP' and 'DOWN' keys on the keypad, and then pressing the 'ENTER' key to select that test (Fig 48). The first stimulus added in this way will appear with the number '1' designation beside it on the LCD. Then, the next test stimulus in the sequence is chosen in the same way, and it will show '2' beside it, and so on if required.

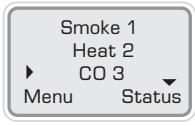


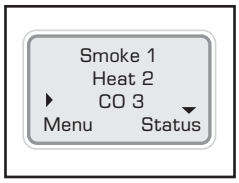
Fig. 48

- To cycle between the different tests in a Sequential Test, Testifire needs to be lowered slightly for at least 2 seconds, but not more than 10 seconds (re-establishing the infrared beam) so that it can advance to the next test (see Fig. 47[3]). Example: For testing 'Smoke' followed by 'Heat' and then 'CO', Testifire is raised over the detector, the detector interrupts the infrared beam and the 'Smoke' test begins. The test is successful (or fails after Testifire times out). Lower the head unit for 2 seconds so that the detector is clear of the clear cup and bellows, and then raise it again to start the 'Heat' test. Repeat this procedure for the 'CO' test.

- During a Sequential Test, the detector needs to be removed from the cup for more than 2 seconds to enable Testifire to advance to the next test in the programmed sequence. If the detector does not re-enter the cup within 10 seconds, the test sequence will reset and return to the first test of the programmed sequence.

- Another identical test sequence will automatically be ready to begin at this point, and there is no need to re-select the test on the keypad. Fig. 49 illustrates the procedure for a Sequential Test (in this example for 'Smoke' followed by 'Heat' and then 'CO').

1. Programme the tests:
Smoke 1
Heat 2
CO 3



2. Raise Testifire over the detector:
The 'Smoke' test begins.

3. Lower Testifire from the detector for 2-10 seconds:
Testifire selects the next test in the sequence; in this case 'Heat'.

4. Raise Testifire over the detector:
'Heat' is tested as the second test in the sequence.

5. Lower Testifire from the detector for 2-10 seconds:
Testifier selects the next test in the sequence; in this case 'CO'.

6. Raise Testifire over the detector:
'CO' is tested as the third test in the sequence.

7. Lower Testifire from the detector:
The tests are completed and Testifire is ready to test another detector in the same way.

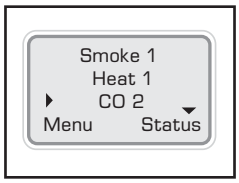
Fig. 49

- To delete a test sequence, use the 'ESCAPE' key ⊗.

5.10 Combined Simultaneous and Sequential Testing

If required, a combination of Simultaneous and Sequential Testing is possible with Testifire. Using the above methods it is possible to programme a number of combinations into the unit. In the example below, 'Heat' and 'Smoke' are combined as the first operation, followed by a 'CO' test. (Note: you will still need to lower the head unit for 2 seconds after the 'Smoke' and 'Heat' test is completed and raise it again to initiate the 'CO' test). Fig. 50 illustrates the procedure for a Combined Simultaneous and Sequential Test (in this example for 'Smoke' and 'Heat' at the same time followed by a 'CO').

1. Programme the tests:
Smoke 1
Heat 1
CO 2



2. Raise Testifire over the detector:
'Smoke' and 'Heat' are tested at the same time as the first test in the sequence.

3. Lower Testifire from the detector for 2-10 seconds:
Testifire selects the next test in the sequence; in this case 'CO'.

4. Raise Testifire over the detector:
'CO' is tested as the second test in the sequence in the same way.

5. Lower Testifire from the detector:
The tests are completed and Testifire is ready to test another detector in the same way.

Fig. 50

5.11 Infrared Remote Control (Testifire 25)

Some types of detector may not automatically initiate a test as they enter the clear cup of Testifire. The Infrared Remote Control can be used to manually start a test, and/or move on to the next test in the sequence. Aim the infrared beam LED at the Testifire head unit when it is at height and use the operation button on the Infrared Control Unit to start/stop a test.

The Infrared Control Unit is powered by two AAA batteries which can be replaced by opening the panel located on the back of the unit.

Infrared beam receivers on Testifire user interface (Series 2 Testifire)

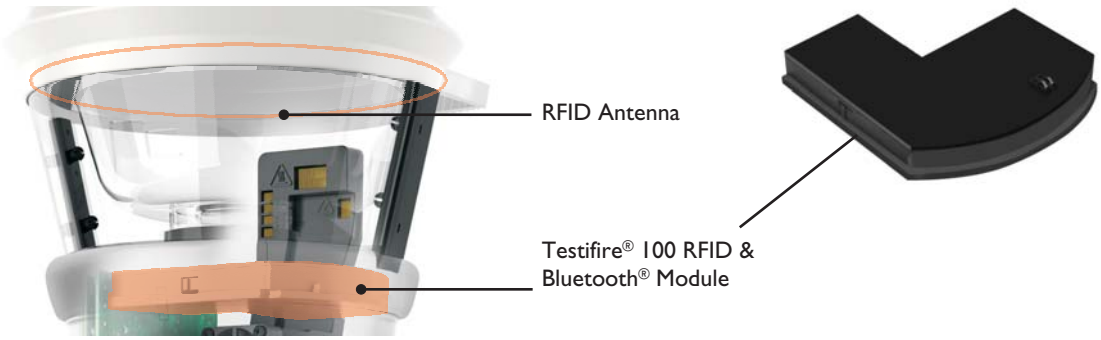
5.12 RFID Auto Tests (Testifire 100)

A Testifire 100 communication module (which includes RFID and Bluetooth®) will be available as a future option.

Amongst other reporting functions, a detector can be identified via an RFID tag which may be fixed to the back of the fire detector. This enables communication between Testifire and the tag and thereby allows Testifire to identify the detector and perform the correct test/s automatically without programming.

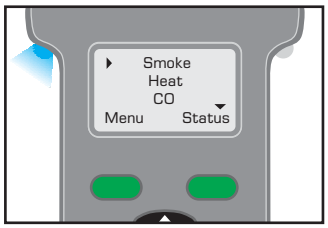
Using an open protocol Bluetooth® link, Testifire also offers the ability to communicate with any supporting third party software application. This allows data to be exchanged between the RFID tag (label) and a PDA including, for example, the identity of test personnel, the maintenance company, time and date of test and test results.
To be able to use this feature, each detector must be fitted with a Testifire compatible RFID tag and the type of test that is required to be performed automatically will need to be programmed into the tag.

Once the Testifire communication module is available details will be available from our website: www.testifire.com.



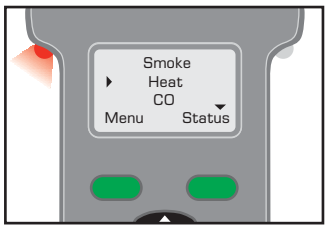
5.13 Indicating LED Reference Chart

‘Test Type’ LED



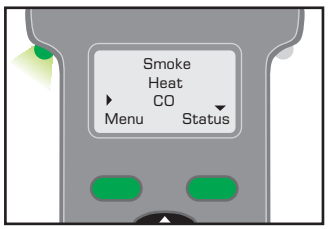
Blue Solid

Smoke Test in progress



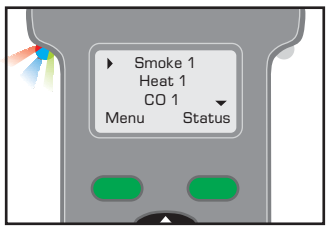
Red Solid

Heat Test in progress



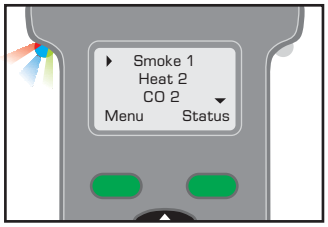
Green Solid

CO Test in progress



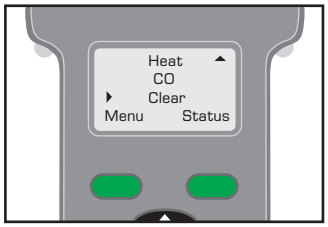
Red/Blue/Green Alternating

Smoke, Heat & CO test in progress at the same time (Simultaneous Testing)



Blue Solid/ then Red/Green Alternating

‘Test in progress’ portion of Smoke, then Heat & CO combined testing (Sequential Testing)



Not Illuminated
Clearing mode in operation

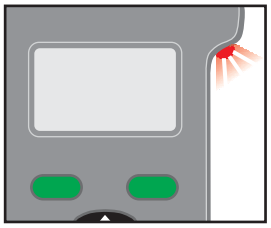
‘Status’ LED

Green Slow Flashing

‘STANDBY’ Mode

Green Fast Flashing

‘OPERATIONAL’ Mode
(test in progress)

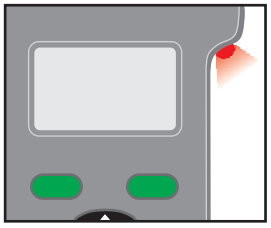


Red Flashing
(slow red flashing in ‘STANDBY’ mode or fast red flashing in operation)

Battery needs charging - Testifire still operational
(see Section 4.1)

Alternating Red/Green Flashing

‘TIME OUT’ Indication (after 2 minutes of continuous testing on one stimulus or combination of stimuli)



Red Solid

Error - see message on display (see Section 6.1)

Alternating Green flashes

"CO Cooling phase" - Indication after a CO test has been carried out. Further CO test cannot be carried out until Status LED shows "STANDBY" mode.

6. Troubleshooting

If you experience any type of problem with your Testifire, turn the power off, wait for a few seconds and then turn the power back on. This may clear the fault. If the fault continues, the following information may help you solve the problem. If you are unable to identify the cause of the problem, please contact your regional support centre.

6.1 Errors

- When an error occurs, the 'Status' LED will remain on in red and the 'Test Type' LED will not be illuminated. This can be clearly seen without access to the LCD screen when the unit is at height.
- The unit will emit a 2 second 'warning beep' (if the 'beep' sound is enabled) and cease to function further. The LCD screen will display the error message (see Section 6.3).
- In some cases the error message may be cleared from the LCD by pressing the 'ESCAPE' key ⊗ on the keypad. This may enable the unit to continue operating, although if the error has not been corrected the error message may reappear immediately on the LCD.
- You will need to correct the error in order to proceed. For example, if the battery is Low, the LCD will display the message 'Replace Battery'. In this case, no further testing can be carried out until the Battery Baton has been recharged or replaced.
- A complete listing of the screen error messages and indicating LED colours is detailed in Section 6.3.
- For RFID error messages see the RFID Manual at: www.testifire.com.

6.2 System Reset

- When you have followed the above steps and you still have a problem, carry out a 'System Reset' to restore your Testifire unit back to the factory defaults. A 'System Reset' will remove all user customisable settings including:
  - Clear all programmed test sequences
  - Turn off the Timer option
  - Turn Warning and Keypad Sound 'beeps' on
  - Revert to 'Heat' if 'Hi-Heat' has been selected
  - Remove the selected language
- To carry out a 'System Reset', press the 'MENU' key on the keypad (Fig. 51) and use the 'UP' and 'DOWN' keys ⇕ to navigate to the 'System Reset' (Fig. 52). Press the 'ENTER' key ✓ to select the 'System Reset'. This will display a 'System Reset' confirmation screen (Fig. 53). Select 'Ok' by pressing the 'MENU' key to execute the 'System Reset' or select 'Cancel' by pressing the 'Status' key to cancel a 'System Reset'.

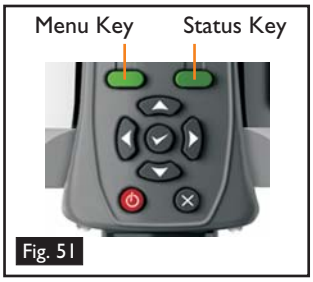


Fig. 51

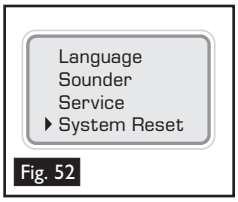


Fig. 52

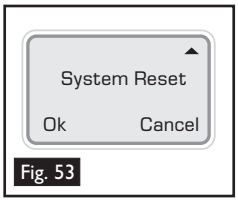
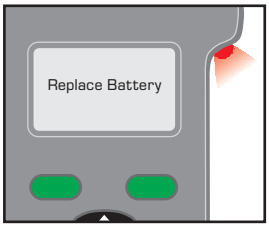


Fig. 53

- Following a 'System Reset', the Testifire logo will appear on the start up screen, followed by the 'Select System Language' option (see Section 4.4).

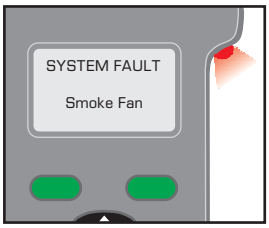
6.3 Error Messages and Indicating LED Reference Chart

Note: If a problem occurs with your Testifire unit, the 'Status' LED will flash or remain on in red and the 'Test Type' LED will not be illuminated. The error message will be displayed on the screen.



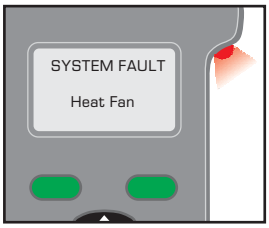
If the 'Status' LED is flashing you need to recharge or replace the Battery Baton soon.

If the 'Status' LED is solid red, you must recharge or replace the Battery Baton immediately.



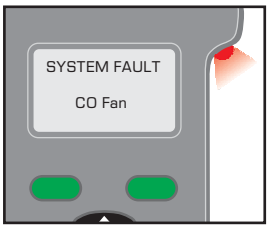
A problem has occurred with the Smoke Fan.

If the error continues, contact your regional service centre to arrange for repair of the fault.



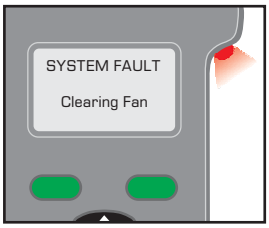
A problem has occurred with the Heat Fan.

If the error continues, contact your regional service centre to arrange for repair of the fault.



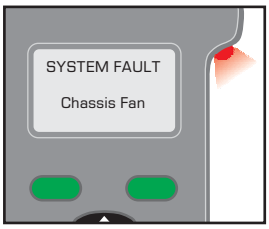
A problem has occurred with the CO Fan.

If the error continues, contact your regional service centre to arrange for repair of the fault.



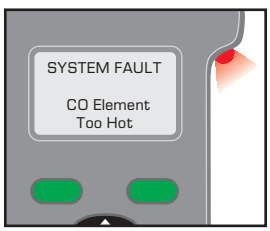
A problem has occurred with the Clearing Fan.

If the error continues, contact your regional service centre to arrange for repair of the fault.



A problem has occurred with the Chassis Fan.

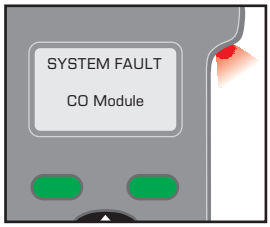
If the error continues, contact your regional service centre to arrange for repair of the fault.



The CO element is too hot.

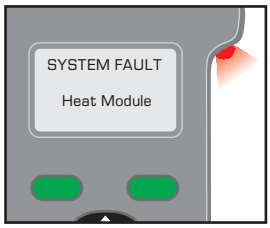
Power off and leave too cool for 5 minutes. Power on and try the same test again.

If the same message is displayed, contact your regional service centre to repair the fault.



A problem has occurred with the CO Module.

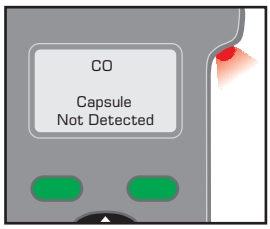
Contact your regional service centre to arrange for repair of the fault.



A problem has occurred with the Heat Module.

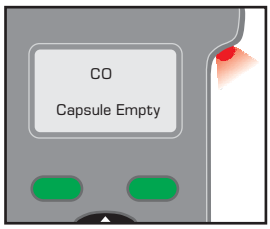
Contact your regional service centre to arrange for repair of the fault.

Capsule Error Messages (Smoke and CO):



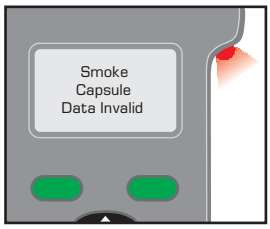
Capsule not installed.

Reseat capsule (if installed) or install a new capsule.



Capsule empty.

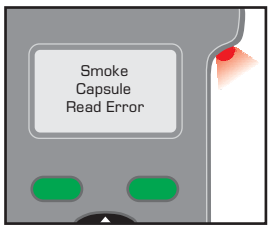
Install a new capsule.



Capsule damaged or not seated correctly.

Reseat capsule.

If the error persists, replace capsule.



Capsule damaged or not seated correctly.

Reseat capsule.

If the error persists, replace capsule.

7. Support

7.1 Technical Support

For support, service and further information, please contact:

No Climb Products Ltd
Edison House, 163 Dixons Hill Road, Welham Green, Herts, AL9 7JE United Kingdom
Tel: +44 (0) 1707 282760 Fax: +44 (0) 1707 282777
Email: support@testifire.com

Online help available at www.testifire.com

7.2 Firmware Updates

- All Testifire head units have a built-in Mini B USB port on the side of the casing (Fig. 54 **A**). Using the supplied A-Standard to B-Mini 5 pin flat USB cable (**B**), Testifire can be connected to a computer to allow software updates to be uploaded (**C**).
- Testifire should only be connected to personal computing equipment which complies with relevant safety and EMC standards.
- Only the Testifire-supplied USB 2.0 cable should be used to connect Testifire to a USB-enabled personal computer (PC).
- Firmware updates (available at: http:/www.testifire.com/site/technical/) can be download to your Testifire unit by using the Testifire Flash Loader application (see **Section 7.7** for the Testifire Flash Loader Instructions).

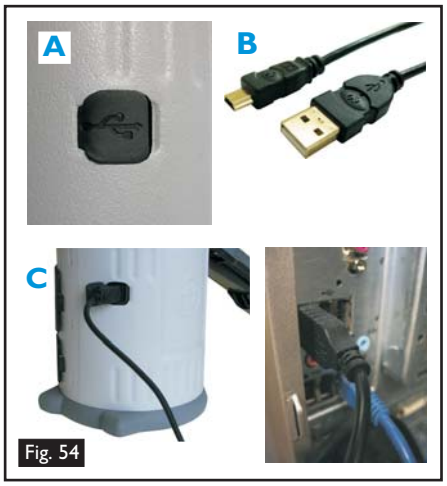


Fig. 54

- The Testifire Flash Loader End User Licence Agreement (EULA) can be found in **Section 10**.

7.3 System Information

- To display the 'System Information', turn the unit on using the 'ON-OFF' key . Press the 'MENU' key to display the menu and use the 'UP' and 'DOWN' keys to navigate to the 'System Info.' (Fig. 55). Press the 'ENTER' key to access the system information menu (Fig. 56). Press the 'ESCAPE' key to return to the 'MAIN' menu.

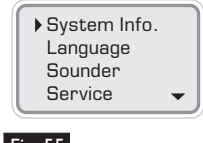
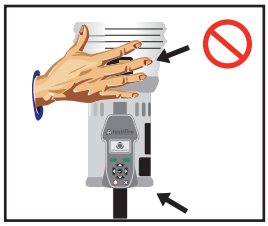


Fig. 55

Fig. 56

7.4 Maintenance

- The Testifire unit contains no user serviceable parts.
- Do not disassemble.
- Do not block air vents.
- Use only capsules and batteries specified by the manufacturer.
- In the case of a build-up of dust or dirt on the surface of the product, wipe with a slightly damp lint-free cloth. Do not use detergents, cleaning materials or solvents to clean the product.


⚠ **DO NOT BLOCK AIR VENTS.**


⚠ **NO USER SERVICEABLE PARTS.**

7.5 Servicing

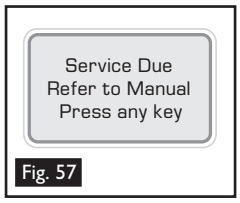


Fig. 57

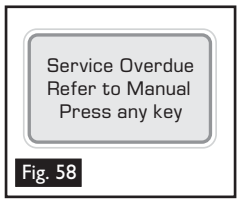


Fig. 58

- To ensure that your Testifire unit continues to perform as intended, it is recommended that the unit is returned annually for a service.
- In some countries, Testifire will require an annual, traceable service in accordance with national or international standards for testing equipment.
- The service that detector**testers**, **No Climb Products Ltd**. carries out uses equipment that is traceable in accordance with ISO9001.
- Testifire has a built-in service interval timer that will alert you when a service is due (Fig. 57) or overdue (Fig. 58).
- When Testifire is used extensively, a service may be required prior to 12 months. Testifire will notify you when a service is due or overdue.
- Please retain your original Testifire packaging and box, if you intend to return your Testifire for servicing.

What tasks are carried out as part of the Service, Calibration and Conformity Check (SCCC)?

With the release of the Mk2 Testifire, Service, Claibration and Conformity Check is carried out via exchange units. You will return your Testifire and an exchange replacement unit will be sent back to by return. Your new Testifire will be supplied with a Calibration and Conformity Certificate and 3 months warranty.

A Service, Calibration and Conformity Certificate will be provided auditing proof that all measurements were made using calibrated instruments and are traceable back to UKAS, National Standards or International Standards, except where none exist. The instrument was calibrated in accordance with the general requirements of ISO 10012:2003 and the Company Quality Management System to ISO 9001:2000 BRE Certification. Certificate No 813.

In accordance with requests from certain sectors of the world market, Testifire models 1000 and 2000 (from firmware version 5.4) now allows the user to turn off the Service notification screens. Anyone that is using an earlier firmware version and wishes to enable this option will need to carry out a Testifire firmware upgrade. Please see http://www.testifire.com/site/technical/ for further information on Testifire firmware updates.

What should I send back for Service, Calibration and Conformity Check?

Please return your Testifire (battery batons and charger are not covered by the Testifire service. Please make sure you include the Testifire inner cup.

Please send you Testifire and the above parts to your reseller.

7.6 Service Reminders

By default Testifire will notify the user when a Service is due or over due. If required the Service reminders can be turned off (Firmware version 5.4 or later).

To disable service reminders, press the 'MENU' key on the keypad and use the 'DOWN' key to navigate to 'Service' (Fig 61). Press the 'ENTER' key to select 'Service'. This will display the Service reminder control screen. (Fig 62). Press 'ENTER' key to turn off the Service reminders.

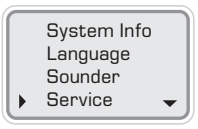


Fig. 61

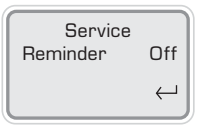


Fig. 62

Please Note: The ability to turn off the Service Reminder Screens was added from firmware version 5.4 (issued Nov 2009).

7.7 Testifire Flash Loader Software Instructions

For Testifire 1000 & 2000 Models

Welcome to the Testifire Flash Loader Software

Before connecting Testifire to the computer, first install the Flash Loader software.

Introduction

Testifire Flash Loader is a free Windows based application that allows you to update your Testifire firmware on your Testifire without the need to return it for service.

The Flash Loader allows the user to upgrade Testifire to the latest firmware version via the computers USB port.

Before you can use the Testifire Flash Loader to update the firmware on your Testifire unit, you must first install the application and Testifire USB drivers. See the Installation instructions below.

The Testifire Flash Loader is intended to be used on a PC that is connected to the internet. It can be used without an Internet Connection as long as you have previously downloaded the appropriate Firmware binary file (this for advanced users). See www.testifire.com/site/technical/

PLEASE READ THE INSTRUCTIONS BEFORE STARTING THE INSTALLATION.

What is Firmware?

Firmware is a computer program that is embedded in a hardware device, in this case Testifire.

Why are updates required?

A Testifire Firmware update could provide either additional functionality and/or enhancements to existing features.

Requirements

Testifire Flash Loader Software
Testifire USB Cable (A to mini B) -Part No: EA36176
Fully charged battery
Internet Connection *

Supported

Windows 2000 Professional
Windows XP x32
Windows Vista x32
USB V1.1 and USB V2.0

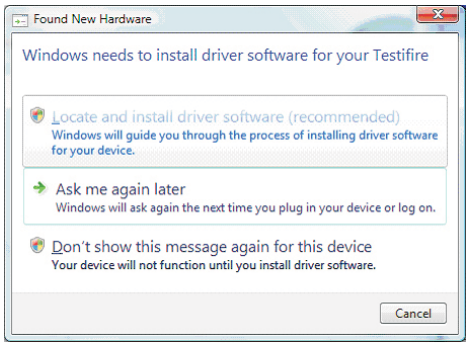
* The Testifire Flash Loader has an automatic feature that allows it to connect to the Internet and download the latest Testifire firmware version. To enable it to this you must have a working internet connection.
Advanced users may manually download a Testifire firmware binary file and manually apply without having access to the internet.

Windows Vista -Testifire Device Driver Installation

Step 1

Run the Flash Loader software and when prompted connect Testifire to the computer using the supplied USB cable.

The "Found New Hardware" wizard will launch.



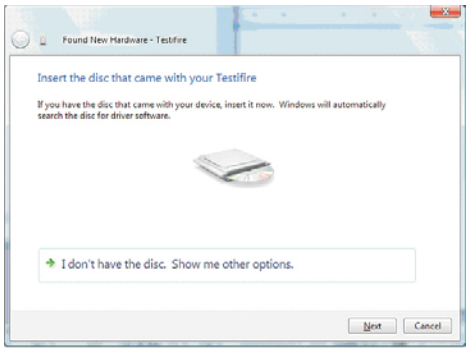
Step 2

Select "Locate and install driver software".

If the User Account control window appears, "Windows need your permission to continue", select continue.

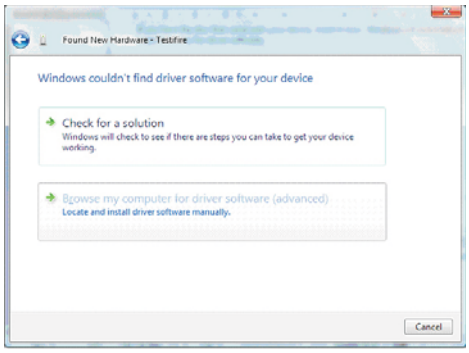
Step 3

Select "I don't have the disc. Show me other options."



Step 4

Select "Browse my computer for driver software".

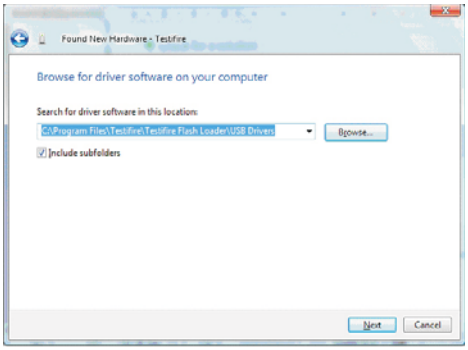


Step 5

The USB drivers are located in the install directory of the Testifire Flash Loader application.

This would usually be C:\Program Files\Testifire\Testifire Flash Loader\USB Drivers

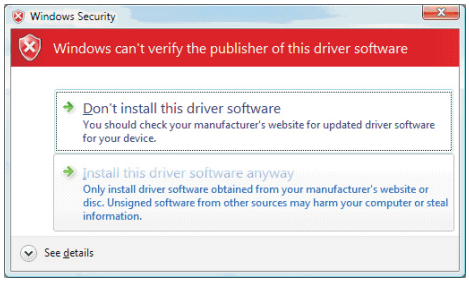
Use the "Browse" button to select the directory where the drivers are located then click "Next".



Step 6

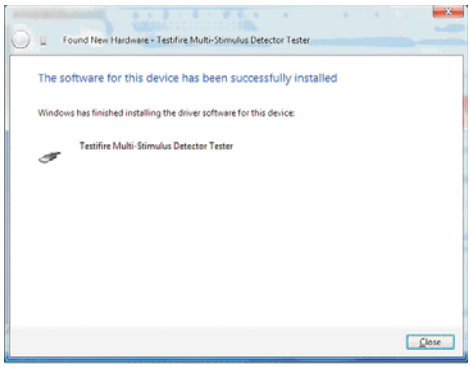
This driver may not yet be digitally signed, however it Windows will now install the Testifire USB drivers. was obtained from either www.testifire.com or the disc Click "Close" to exit the wizard which was supplied with your Testifire then it is safe to use on your computer.

Select "Install this driver software anyway".



Step 7

Windows will now install the Testifire USB drivers. Click "Close" to exit the wizard.



Windows XP -Testifire Device Driver Installation

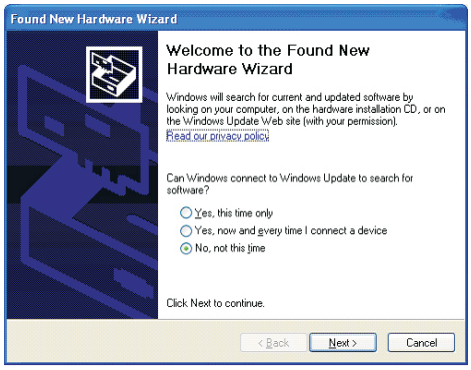
Step 1

Run the Flash Loader software and when prompted Select "Install from a list or specified location" and connect Testifire to the computer using the supplied then click "Next" to continue. USB cable.

The "Found New Hardware" wizard will launch.

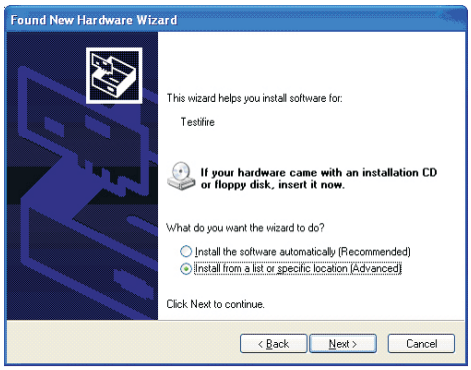
Step 2

Windows will now install the Testifire USB drivers. Click "Close" to exit the wizard.



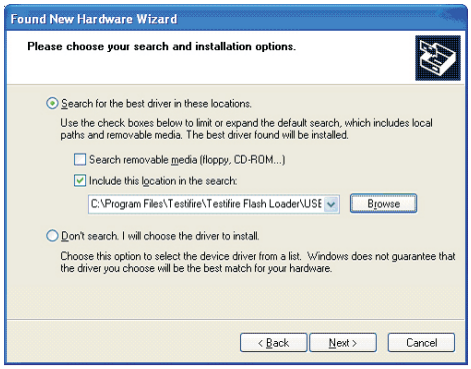
Step 3

Select "Install from a list or specified location" and then click "Next" to continue.



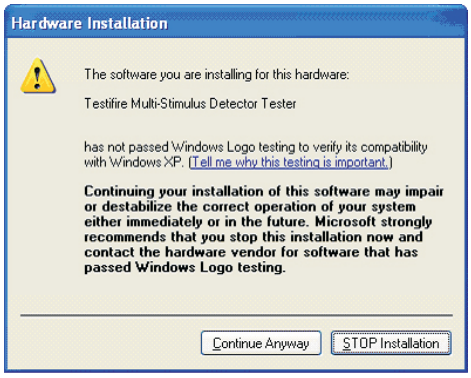
Step 4

Select "Search for the best driver in these locations" and "Include this location in the search".
The USB drivers are located in the install directory of the Testifire Flash Loader application. This would usually be C:\Program Files\Testifire\Testifire Flash Loader\USB Drivers
Use the "Browse" button to select the directory where the drivers are located then click "Next".



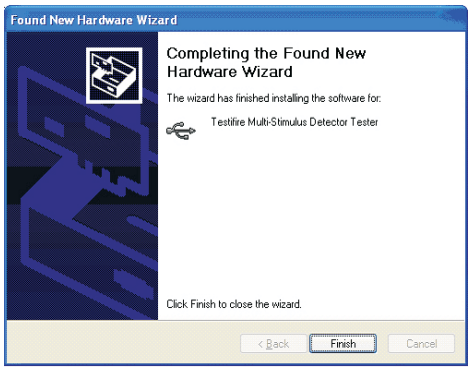
Step 5

This driver may not yet be tested by Windows Logo testing, however if it was obtained from either www.testifire.com or the disc which was supplied with your Testifire then it is safe to use on your computer. Click "Continue Anyway".



Step 6

Windows will now install the Testifire USB drivers. Click "Finish" to exit the wizard.



Windows 2000 - Testifire Device Driver Installation

Step 1

Run the Flash Loader software and when prompted connect Testifire to the computer using the supplied USB cable.
The "Found New Hardware" wizard will launch.

Step 2

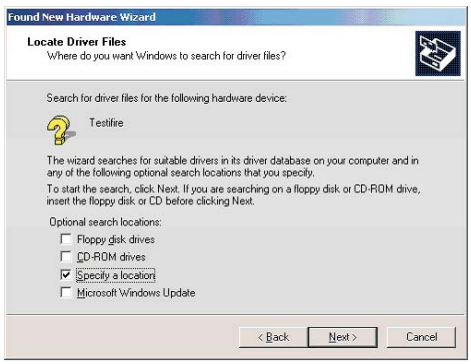
Click "Next" to continue.

Step 3

Select "Search for a suitable driver for my device" then click "Next" to continue.

Step 4

Select "Specify a location" then click "Next" to continue.



Step 5

The USB drivers are located in the install directory of the Testifire Flash Loader application.

This would usually be C:\Program Files\Testifire\Testifire Flash Loader\USB Drivers.

Use the "Browse" button to select the directory where the drivers are located then click "OK".

Step 6

The Testifire driver should be identified. Click "Next" to install.

Step 7

The Testifire driver should be identified. Click "Next" to install.

Updating Your Testifire Firmware

Before connecting Testifire to the computer, first install the Flash Loader software.

Step 1

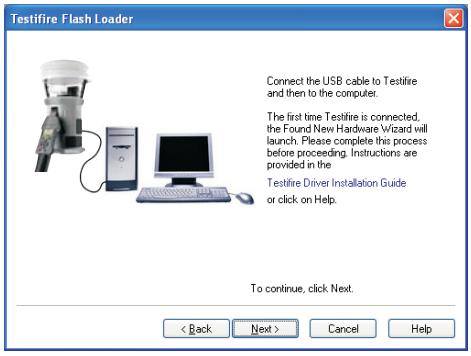
After installing the Testifire Flash Loader software, start the application from either the program menu or desk top icon.

Step 2

Insert a fully charged battery into Testifire and then switch the unit on.

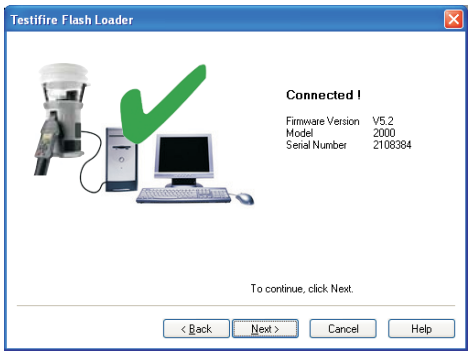
Step 3

Connect the USB cable to Testifire and then to the computer. If the Testifire device drivers have not been previously installed the computer will launch the Found New Hardware Wizard. Please refer to the instructions in the Testifire Driver Installation Guide (link here) before installing the drivers. The drivers must be installed correctly before continuing.

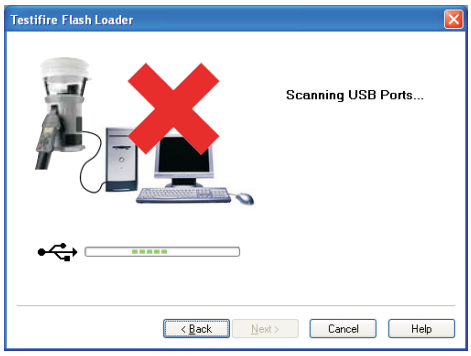


Step 4

The application will now scan the computers USB ports to detect the devices connected. This process should be instant and the screen below will be shown.



If the Testifire is not detected instantly, the scanning process will continues until either the Testifire is detected or the user clicks on Back or Cancel buttons.

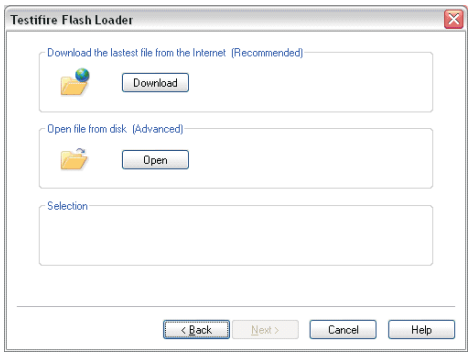


Failure to detect the Testifire may be due to:
The unit is not switched on.
The USB cable is not connected correctly.
The Testifire USB device drivers may not be installed correctly.
The USB port on the computer may not be functioning.
More than one Testifire is connected to the computer at the same time.

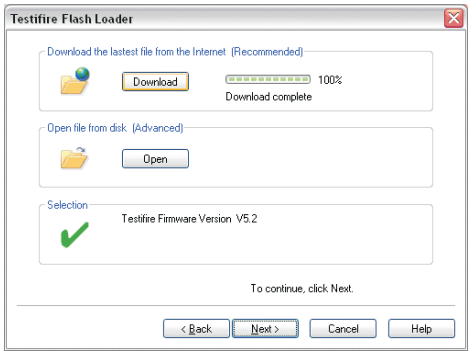
Step 5

The next stage is to load the Testifire firmware file into the application.

Use the Open button to select a file stored on the computers hard disk or use the Download button to automatically download the latest firmware version from the Testifire website.

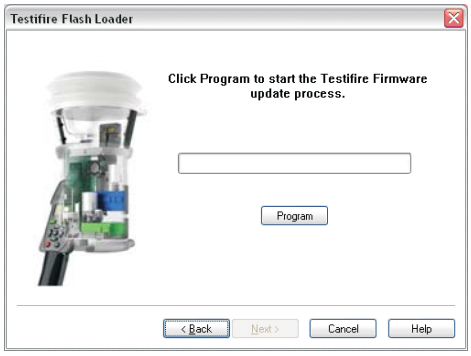


Once the file has been selected it is checked and the version number shown.

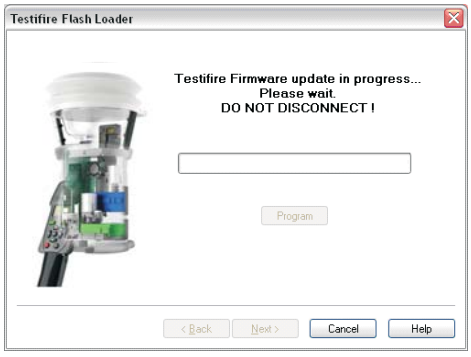


Step 6

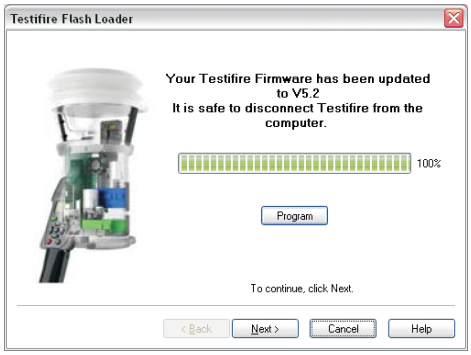
Now start the programming process by pressing the Program button. Testifire is switched into Boot Loader Mode automatically and the new firmware is loaded.



Do not interrupt programming or disconnect the USB cable. The progress bar is shown.



When programming is completed successfully the following screen is shown. Click on the Next button.



In the unlikely event that the programming process fails or programming is aborted by the user, Testifire remains in Boot Loader mode. Click on Cancel to exit the program. Then disconnect the USB cable and Battery Baton from Testifire. The programming process can then be repeated from Step 1.

Testifire will remain in Boot Loader mode until programmed successfully and can not be permanently damaged by this process.

When Testifire is powered up in Boot Loader mode, the screen remains blank and a double beep is sounded. This indicates the Testifire is working and can be programmed as normal from Step 1.

Step 7

Exit the application by pressing Finish.

Technical Support

Contact us

If you experience any problems using the Testifire Flash Loader, do not hesitate to email us at Support@Testifire.com

In order for us to give you a quick and accurate solution please include:
- Description of problem, and how it can be replicated (if applicable).
- Your Operating system (Vista, XP or 2000) and localisation.
- Any other information you think may be helpful.

We will do our best to reply to you within two working days.

For additional information, visit the Testifire Support: www.testifire.com

8. Technical Specifications

Power source	Battery Baton: nominal 7.2V 2.2Ah NiMH rechargeable battery pack with internal overcurrent protection connects directly to Testifire with no leads or wires. Must be charged by Solo 726 Battery Charger (using 100-230VAC or 12VDC input).
Battery Charge Time	Approx. 90 mins. (if completely discharged).
Power consumption	Dependent on mode of use: Smoke testing: <0.5A rms Heat testing: 4-6A rms CO testing: 2-5A rms RFID/Bluetooth® : <150mA rms N.B. Power consumption refers only to the duration of the actual test and may vary considerably due to internal control algorithms.
Test modes	**Smoke**: a simulated smoke generated internally using a miniature heat exchanger and a harmless liquid from the smoke capsule. **Normal Heat**: to test rate-of-rise and fixed temperature heat detectors up to 90°C (194°F). **Hi Heat:** to test rate-of-rise and fixed temperature heat detectors up to 100°C (212°F). **Carbon Monoxide (CO)**: CO is generated internally and blown into the detector at a concentration of approximately 100ppm (not calibrated). CARBON MONOXIDE (CO) IS A HARMFUL, ODOURLESS GAS AND CARE SHOULD BE TAKEN NOT TO INHALE DIRECTLY FROM THE DUCT DURING A CO TEST. **Clearing**: clean air is blown to remove previously applied Smoke or CO. **Simultaneous Testing**: Smoke, Heat and CO (if appropriate) in any combination as programmed by the user are all carried out in one test. **Sequential Testing**: Tests are performed according to the order that they have been programmed by the user. **RFID Auto Mode**: Automatic testing using an RFID module fitted to Testifire and an appropriately programmed RFID label attached to the detector.
Safety Features	Battery over-current cut-out. Default 2 minutes maximum test duration timeout. Auto power off after 10 minutes of non-use. CO generated on demand (no gas stored).
Operating Features	Colour coded LED user feedback. Automatic infrared sensing of the detector. Adjustable multi-position head. Optional fully-automatic configuration (RFID Auto mode).
Suitable Detector Types	Optical / photoelectric and ionisation smoke detectors. Thermal sensors (fixed temperature or rate-of-rise). Carbon Monoxide (CO) fire sensors. Multi-sensors or multi-criteria detectors. Conventional, addressable or analogue addressable detectors of any of the above types.
Environment	Operating temperature range: +5°C to +45°C (41°F to 113°F). Operating humidity range: 0 to 85% RH non-condensing. Storage temperature range: -10°C to +50°C (14°F to 122°F). Storage humidity range: 0 to 90% RH non-condensing (up to +35°C / 95°F).
IP Rating	Rated according to IEC60529 to IP20.

Weights	Testifire 1000: 990g (including Battery Baton) Testifire 2000: 1.23kg (including Battery Baton) Solo 760 Battery Baton: 0.5kg
Dimensions	Testifire 1000: Bellows width: 153mm max. Head Unit height: 224mm max. (397mm including handle) Testifire 2000: Bellows width: 153mm max. Head Unit height: 273mm max. (397mm including handle)

Note: Product specifications may be subject to change without prior notice or obligation on the part of the manufacturer.

International Patents

Testifire is protected by the following patents and has patents applied for:

Patents: EP(FR,GB)091055B, DE69820382.8, ZL98120414.7, US6423962, EP(FR,GB)1290661B, DE60112442.1, ZL01801074.1, US6640608, HK1065150, EP(FR,GB)1390927B, DE50205116.7, DE60314594.9, GB2385179B, GB2409319B.

Patents Applied for: US10/503745, EP1794728A, WO 2007/015045, WO 2007/060447, GB2432703A

8.1 Field Replaceable Parts

Use only approved accessories that are recommended by the manufacturer for your Testifire model. (see Section 9.1)

Testifire does not contain any field serviceable parts. The following spare and consumable parts are available to order from your distributor:

- TS3 Smoke Capsule 3 pack - TS3-3PACK-001
- TS3 Smoke Capsule 6 pack - TS3-6PACK-001
- TC3 CO Capsule 3 pack - TC3-3PACK-001
- TC3 CO Capsule 6 pack - TC3-6PACK-001
- Membrane - SPARE-1049-001
- Inner Cup - SPARE-1048-001
- USB Cable - SPARE-1047-001
- Battery Baton - Solo 760-001
- Charger - Solo 726-001

9. Product Selector

Products

	Application						Accessories				Access	
	Smoke Testing	Heat Testing	CO Testing	Smoke/Heat Testing	Smoke/Heat/ CO Testing	ASD Testing	Battery Baton	Universal Fast Charger	Removal Tool	Protective Carrying Bag	Access Height up to 6m	Access Height up to 9m
 ***testifire* 1000**	●	●		●		●						
 ***testifire* 2000**	●	●	●	●	●	●						
 ***testifire* TS3**	●											
 ***testifire* TC3**			●									
 ***testifire* 1001**	●	●		●		●	● (x 2)	●				
 ***testifire* 2001**	●	●	●	●	●	●	● (x 2)	●				
 ***testifire* 6001**	●	●		●		●	● (x 2)	●	●	●	● (Solo 100 x 1)	
 ***testifire* 6201**	●	●	●	●	●	●	● (x 2)	●	●	●	● (Solo 100 x 1)	
 ***testifire* 9001**	●	●		●		●	● (x 2)	●	●	●		● (Solo 100 + Solo 101 x 3)
 ***testifire* 9201**	●	●	●	●	●	●	● (x 2)	●	●	●		● (Solo 100 + Solo 101 x 3)

Accessories

	Infrared Remote Control	Universal Battery Baton	Fast Charger	Removal Tool	Protective Carrying Bag	Access Height up to 6m	Access Height up to 9m
 Testifire 25	●						
 Solo 200				●			
 Solo 760		●					
 Solo 726			●				
 Solo 100						● (Solo 100 x 1)	
 Solo 101							● (Solo 100 + Solo 101 x 3)
 Solo 610					●		

Solo Poles Access Height

Solo™ Model No.	Access Height (approx. max.)
100	6m (20ft)
100+101 (1)	7m (23ft)
100+101 (2)	8m (26.25ft)
100+101 (3)	9m (30ft)

10. Agreement for Supply of Products and Associated Software

IMPORTANT NOTICE: PLEASE READ CAREFULLY BEFORE EITHER:

(A) DOWNLOADING ANY SOFTWARE FROM THIS WEBSITE, OR
(B)OPENING THE PACKAGING, OR (C) INSTALLING THE SOFTWARE:

This Agreement for Supply of Products and Software (Agreement) is a legal agreement between you (Licensee or you) and No Climb Products Limited (Licensor or we) for (i) the Licensor's Product and (ii) all related software and all future upgrades thereto (Software). This Agreement also applies to any data supplied with the Software, associated media, printed materials and related documentation.

(**Documentation**).

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1.1 In consideration of you agreeing to abide by the terms of this Agreement, the Licensor hereby grants to you a non-exclusive, non-transferable Agreement to use the Software and the Documentation solely in conjunction with the Licensor's Products on the terms of this Agreement.

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2. LICENSEE'S UNDERTAKINGS

2.1 Except as expressly set out in this Agreement or as permitted by any local law, you undertake:
(a) not to copy the Software or Documentation except where such copying is incidental to normal use of the Software, or where it is necessary for the purpose of back-up or operational security;
(b) not to rent, lease, sub-license or loan, the Software or Documentation;
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Software, nor permit the Software or any part of it to be combined with, or become incorporated in, any other programs;
(e) not to disassemble, decompile, reverse engineer or create derivative works based on, the whole or any part of the Software nor attempt to do any such things except to the extent that (by virtue of section 296A of the Copyright, Designs and Patents Act 1988) such actions cannot be prohibited because they are essential for the purpose of achieving inter-operability of the Software with another software program, and provided that the information obtained by you during such activities:
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(iii) is not used to create any software which is substantially similar to the Software; SRH/SM/SM/573.4/502256.8
(f) to keep all copies of the Software secure and to maintain accurate and up-to-date records of the number and locations of all copies of the Software;
(g) to supervise and control use of the Software and ensure that the Software is used by your employees and representatives in accordance with the terms of this Agreement;
(h) to replace the current version of the Software with any updated or upgraded version or new release provided by the Licensor under the terms of this Agreement immediately on receipt where the Licensor specifically recommends that you do so;
(i) to include the copyright notice of the Licensor on all entire and partial copies you make of the Software on any medium;
(j) not to provide or otherwise make available the Software in whole or in part (including but not limited to program listings, object and source program listings, **object code and source code), in any form to any person [other than your employees] without prior written consent from the Licensor;**
2.2 You must permit the Licensor and his representatives, at all reasonable times and on reasonable advance notice, to inspect and have access to any premises at which the Software or the Documentation is being kept or used, to the computer equipment located there, and to any records kept pursuant to this Agreement, for the purpose of ensuring that you are complying with the terms of this Agreement.

3. INTELLECTUAL PROPERTY RIGHTS

3.1 You acknowledge that all intellectual property rights in the Software and the Licensor's Products and the Documentation anywhere in the world belong to the Licensor, that rights in the Software are licensed (not sold) to you, and that you have no rights in, or to, the Software or the Documentation other than the right to use them in accordance with the terms of this Agreement.
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3.3 The integrity of this Software, or any future upgrade of this software, may at any time be protected by technical protection measures (TPM) so that the intellectual property rights, including copyright, in the Software of the Licensor are not misappropriated. You must not attempt in any way to remove or circumvent any such TPM, nor apply or manufacture for sale or hire, import, distribute, sell or let for hire, SRH/SM/SM/573.4/502256.8 offer or expose for sale or hire, advertise for sale or hire or have in your possession for private or commercial purposes any means the sole intended purpose of which is to facilitate the unauthorised removal or circumvention of such TPM.

3. INTELLECTUAL PROPERTY RIGHTS

3.1 You acknowledge that all intellectual property rights in the Software and the Licensor's Products and the Documentation anywhere in the world belong to the Licensor, that rights in the Software are licensed (not sold) to you, and that you have no rights in, or to, the Software or the Documentation other than the right to use them in accordance with the terms of this Agreement.
3.2 You acknowledge that you have no right to have access to the Software in source code form or in unlocked coding or with comments.
3.3 The integrity of this Software, or any future upgrade of this software, may at any time be protected by technical protection measures (TPM) so that the intellectual property rights, including copyright, in the Software of the Licensor are not misappropriated. You must not attempt in any way to remove or circumvent any such TPM, nor apply or manufacture for sale or hire, import, distribute, sell or let for hire, SRH/SM/SM/573.4/502256.8 offer or expose for sale or hire, advertise for sale or hire or have in your possession for private or commercial purposes any means the sole intended purpose of which is to facilitate the unauthorised removal or circumvention of such TPM.

4. WARRANTY

4.1 The Licensor warrants that:
For a period of 90 days from the date of purchase, installation or download as the case may be (Warranty Period) the Licensor's Products and Software will, when properly used, perform substantially in accordance with the functions described in the Documentation;
4.2 You acknowledge that the Software has not been developed to meet your individual requirements, and that it is therefore your responsibility to ensure that the facilities and functions of the Software as described in the Documentation meet your requirements.
4.3 You acknowledge that the Software may not be free of bugs or errors, and agree that the existence of minor errors shall not constitute a breach of this Agreement.
4.4 If, within the Warranty Period, you notify the Licensor in writing of any defect or fault in the Software in consequence of which it fails to perform substantially in accordance with the Documentation, and such defect or fault does not result from you having amended the Software or used it in contravention of the terms of this Agreement, the Licensor will, at its sole option, either repair or replace the Software, provided that you make available all the information that may be necessary to help the Licensor to remedy the defect or fault, including sufficient information to enable the Licensor to recreate the defect or fault.

5. LICENSOR'S LIABILITY

5.1 Nothing in this Agreement shall exclude or in any way limit the Licensor's liability for fraud, or for death or personal injury caused by its negligence, or any other liability to the extent that it may not be excluded or limited as a matter of law.
5.2 Subject to condition 5.1 the Licensor shall not be liable under, or in connection with, this Agreement or any collateral contract for:
(a) loss of income;
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(b) loss of business profits or contracts;
(c) business interruption;
(d) loss of the use of money or anticipated savings;
(e) loss of information;
(f) loss of opportunity, goodwill or reputation;
(g) loss of, damage to or corruption of data; or
(h) any indirect or consequential loss or damage of any kind howsoever arising and whether caused by tort (including negligence), breach of contract or otherwise; provided that this condition 5.2 shall not prevent claims for loss of or damage to your tangible property that fall within the terms of condition 4 or any other claims for direct financial loss that are not excluded by any of categories (a) to (h) inclusive of this condition 5.2.
5.3 Subject to condition 5.1 and condition 5.2, the Licensor's maximum aggregate liability under or in connection with this Agreement, or any collateral contract, whether in contract, tort (including negligence) or otherwise, shall be limited to a sum equal to 100% of the price of the related Licensor's Products and Software giving rise to liability.

5.4 Subject to condition 5.1, condition 5.2 and condition 5.3, the Licensor's liability for infringement of third-party intellectual property rights shall be limited to breaches of rights subsisting in the UK.
5.5 This Agreement sets out the full extent of the Licensor's obligations and liabilities in respect of the supply of the Licensor's Products, Software and Documentation. In particular, there are no conditions, warranties, representations or other terms, express or implied, that are binding on the Licensor except as specifically stated in this Agreement. Any condition, warranty, representation or other term concerning the supply of the Licensor's Products, Software and Documentation which might otherwise be implied into, or incorporated in, this Agreement, or any collateral contract, whether by statute, common law or otherwise, is hereby excluded to the fullest extent permitted by law.
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6. TERMINATION

6.1 The Licensor may terminate this Agreement immediately by written notice to you if:
(a) You commit a material or persistent breach of this Agreement which you fail to remedy (if remediable) within 14 days after the service of written notice requiring you to do so; or
(b) a petition for a bankruptcy order to be made against you has been presented to the court; or
(c) the Licensee (where it is a company) becomes insolvent or unable to pay its debts (within the meaning of section 123 of the Insolvency Act 1986), enters into liquidation, whether voluntary or compulsory (other than for reasons of bona fide amalgamation or reconstruction), passes a resolution for its winding-up, has a receiver or administrator manager, trustee, liquidator or similar officer appointed over the whole or any part of its assets, makes any composition or arrangement with its creditors or takes or suffers any similar action in consequence of its debt, unable to pay your debts (within the meaning of section 123 of the Insolvency Act 1986).
6.2 Upon termination for any reason:
(a) all rights granted to you under this Agreement shall cease;
(b) you must cease all activities authorised by this Agreement;
(c) you must immediately pay to the Licensor any sums due to the Licensor under this Agreement; and
(d) you must immediately delete or remove the Software from all computer equipment in your possession, and immediately destroy or return to the Licensor (at the Licensor's option) all copies of the Software then in your possession, custody or control and, in the case of destruction, certify to the Licensor that you have done so.

7. TRANSFER OF RIGHTS AND OBLIGATIONS

7.1 This Agreement is binding on you and us, and on our respective successors and assigns.
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7.2 You may transfer, assign, charge or otherwise dispose of this Agreement, or any of your rights or obligations arising under it, without our prior written consent provided that the beneficiary of any such any transfer, assignment, charge or disposal must have agreed to abide by the terms of this Agreement prior to or at the time of any such transfer, assignment, charge or disposal. The transfer, assignment, charge or disposal must include all copies of all versions (including but not limited to the most recent version) of the Software as well as all copies of the Documentation and all accompanying instances of the Licensor's Products.
7.3 We may transfer, assign, charge, sub-contract or otherwise dispose of this Agreement, or any of our rights or obligations arising under it, at any time during the term of the Agreement.

8. NOTICES

All notices given by you to us must be given to No Climb Products Limited at Edison House, 163 Dixons Hill Road, Welham Green, Hertfordshire, AL9 7JE. We may give notice to you at either the e-mail or postal address you provided to us OR our representative when purchasing the Software. Notice will be deemed received and properly served immediately when posted on our website, 24 hours after an e-mail is sent, or three days after the date of posting of any letter. In proving the service of any notice, it will be sufficient to prove, in the case of a letter, that such letter was properly addressed, stamped and placed in the post and, in the case of an e-mail, that such e-mail was sent to the specified e-mail address of the addressee.

9. EVENTS OUTSIDE OUR CONTROL

9.1 We will not be liable or responsible for any failure to perform, or delay in performance of, any of our obligations under this Agreement that is caused by events outside our reasonable control (Force Majeure Event).
9.2 A Force Majeure Event includes any act, event, non-happening, omission or accident beyond our reasonable control and includes in particular (without limitation) the following:
(a) strikes, lock-outs or other industrial action;
(b) civil commotion, riot, invasion, terrorist attack or threat of terrorist attack, war (whether declared or not) or threat or preparation for war;
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(c) fire, explosion, storm, flood, earthquake, subsidence, epidemic or other natural disaster;
(d) impossibility of the use of railways, shipping, aircraft, motor transport or other means of public or private transport;
(e) impossibility of the use of public or private telecommunications networks;
(f) the acts, decrees, legislation, regulations or restrictions of any government. 9.3 Our performance under this Agreement is deemed to be suspended for the period that the Force Majeure Event continues, and we will have an extension of time for performance for the duration of that period. We will use our reasonable endeavours to bring the Force Majeure Event to a close or to find a solution by which our obligations under this Agreement may be performed despite the Force Majeure Event.

10. WAIVER

10.1 If we fail, at any time during the term of this Agreement, to insist upon strict performance of any of your obligations under this Agreement, or if we fail to exercise any of the rights or remedies to which we are entitled under this Agreement, this shall not constitute a waiver of such rights or remedies and shall not relieve you from compliance with such obligations.
10.2 A waiver by us of any default shall not constitute a waiver of any subsequent default.
10.3 No waiver by us of any of these terms and conditions shall be effective unless it is expressly stated to be a waiver and is communicated to you in writing.

11. SEVERABILITY

If any of the terms of this Agreement are determined by any competent authority to be invalid, unlawful or unenforceable to any extent, such term, condition or provision will to that extent be severed from the remaining terms, conditions and provisions which will continue to be valid to the fullest extent permitted by law.
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12. ENTIRE AGREEMENT

12.1 This Agreement and any document expressly referred to in it represents the entire agreement between us in relation to the licensing of the Software and Documentation and supersedes any prior agreement, understanding or arrangement between us, whether oral or in writing.
12.2 We each acknowledge that, in entering into this Agreement, neither of us has relied on any representation, undertaking or promise given by the other or be implied from anything said or written in negotiations between us prior to entering into this Agreement except as expressly stated in this Agreement.
12.3 Neither of us shall have any remedy in respect of any untrue statement made by the other, whether orally or in writing, prior to the date we entered into this Agreement (unless such untrue statement was made fraudulently) and the other party's only remedy shall be for breach of contract as provided in these terms and conditions.

13. LAW AND JURISDICTION

This Agreement is governed by English law. Any dispute arising from, or related to, any term of this Agreement shall be subject to the exclusive jurisdiction of the courts of England and Wales.

As our policy is one of continuous improvement, details of products described within this publication are subject to change without notice. All information provided here is believed to be correct at the time of going to press. Every effort has been made to ensure the accuracy of information which is provided in good faith but nothing contained herein is intended to incorporate any representation or warranty, either express or implied or to form the basis of any legal relations between the parties hereto, additional to or in lieu of such as may be applicable to a contract of sale or purchase.

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MULTI-STIMULUS DETECTOR TESTER

Quick Start Guide

SIGNALING

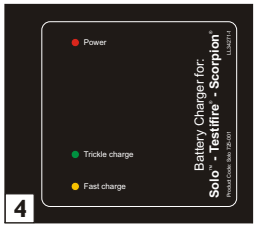
CLASSIFIED UL

Multi-Detector Test Apparatus as to Verification of Detector Functional Operation Only
77TL

Quick Start Guide to *testifire*® MULTI STIMULUS DETECTOR TESTER

Preparation For Use

1. Charging the Battery Baton



- The charger can be connected to a mains power outlet or a 12 volt vehicle socket (**1**). When connected, the red Power LED will illuminate.
- Connect the Battery Baton to the charger and turn the locking ring (**2** & **3**).
- The yellow Fast Charge LED will illuminate (**4**).
- Charge times vary but can be 75-90 minutes when charging a fully discharged Battery Baton.
- When fully charged, the charger will switch to Trickle Charge and the green LED will illuminate (**4**).

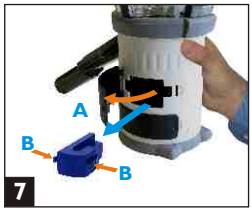
Note: Use only NiMH Battery Batons with Testifire.

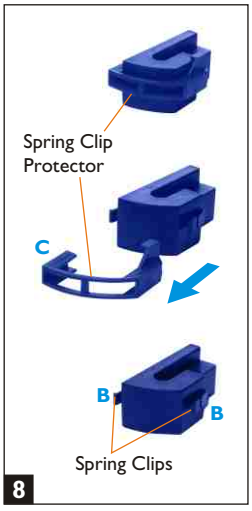
2. Inserting the Battery Baton

- To insert the Battery Baton, hold the Testifire head unit by the handle and depress the upper spring button on the Battery Baton. Align the button with the location hole in the handle and push the Battery Baton into the handle until the button springs up through the location hole (**5**).

- Insert the other end of the Battery Baton into the Solo access pole and depress the lower spring button. Align it with the location hole and push the Battery Baton further into the pole until the button springs up through the hole (**6**).

3. Removal & Replacement of Smoke Capsules (Testifire 1000 & 2000 series)





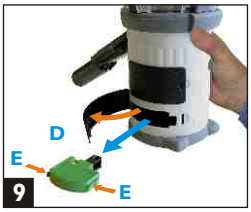
Removal:

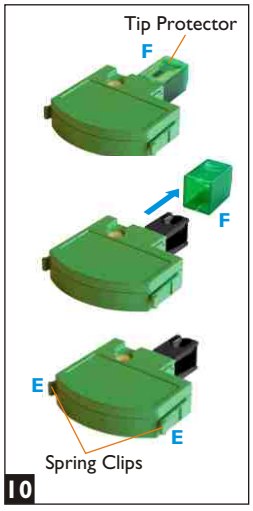
- Release the upper access cover **A** (**7**) on the body of the Testifire by opening it from the right hand side. **Note:** Testifire 1000 series units only have one access cover.
- Squeeze the two clips **B** of the used capsule and gently pull the capsule out.

Replacement:

- Remove the capsule from its outer carton and Anti-Static bag.
- Remove the spring clip protector cap from the new capsule **C** (**8**).
- Holding the capsule by the spring clips with the label on the underside, carefully insert the new capsule into the capsule port. Push it into position, ensuring that the clips spring out positively on both sides of the capsule.
- Close the access cover **A** securely.

4. Removal & Replacement of CO Capsules (Testifire 2000 series only)





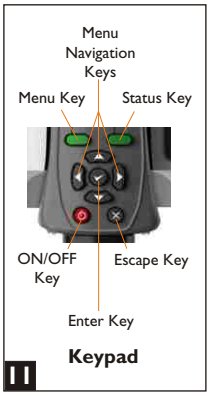
Removal:

- Only replace the CO capsule when it is empty. Turn Testifire off for five minutes to allow the capsule to cool down before removing it.
- Release the lower access cover **D** (**9**) by opening it from the right hand side.
- Squeeze the spring clips **E** on each side and gently pull the capsule out.
- Do not touch the tip of the CO capsule as it may be hot.

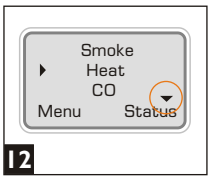
Replacement:

- Remove the capsule from its carton and Anti-Static bag.
- Remove the tip protector **F** (**10**).
- Hold the capsule by the spring clips with the label uppermost. Carefully insert into position, ensuring that the clips spring out positively on both sides.
- Close the access cover **D** securely.

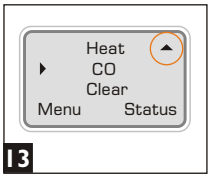
5. Using the Menus



- Using the 'UP' and 'DOWN' menu navigation keys (**11**), you can move the cursor through the 'MAIN' menu. Press the 'ENTER' key to select stimuli from the 'MAIN' menu.
- Pressing the 'ESCAPE' key goes back to the 'MAIN' menu, or when a test sequence has been programmed and the 'MAIN' menu is displayed, the 'ESCAPE' key will cancel the programmed test sequence.



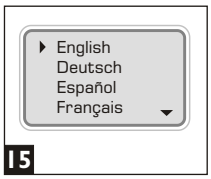
- A 'DOWN' arrow on the bottom right of the 'MAIN' menu indicates more options are available below. Use the 'DOWN' key on the keypad to move down through the menu. (**12**).



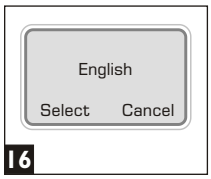
- The 'UP' arrow on the 'MAIN' menu indicates more options available above. Use the 'UP' key on the keypad to move up through the menu (**13**).
- Press the 'LEFT' key on the keypad to go back one menu level.

6. Turning the Unit On

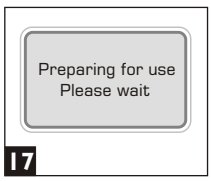
- To turn the unit on, press and hold the red 'ON-OFF key' for 2 seconds (**14**). The 'Status' LED will flash slowly green to indicate that the unit is in 'STANDBY' mode.



- The first time the unit is powered-on you will be prompted to select the operating language for your region. Use the 'UP' and 'DOWN' keys to navigate and use the 'ENTER' key to select your language (**15**).



- This will display a confirmation screen (**16**). Press the 'MENU' key to confirm or the 'STATUS' key to cancel. The 'MAIN' menu will be displayed.



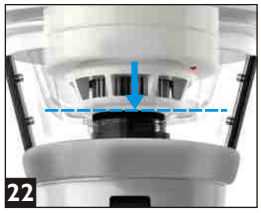
- After long periods of non-use or when a Smoke Capsule has been replaced, the unit will self-prime at power-on. The 'Preparing for use Please wait' message will be displayed for a short period (**17**).

7. Adjusting the Head Angle

- Correct head angle adjustment is important. The detector should touch the base of the inner clear cup (**22**).
- To adjust the head unit hold the body (**18**) and, pulling gently against the spring, angle the head unit away from the Battery Baton (**19**). The head unit will lock and remain in that position for testing.

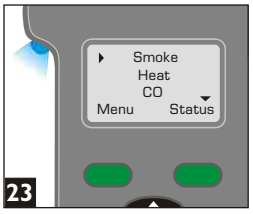
8. Testing High Profile Detectors

- When testing high profile detectors, remove the inner clear cup. Place your finger in the cut-out and carefully lift out the inner cup (**20**). This will allow the detector to touch the platform (**21**).



Testing a Detector

1. How to Perform a Test

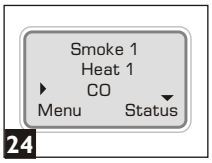


23

- To carry out a simple, single stimuli test, use the 'UP' and 'DOWN' keys on the keypad to highlight the stimulus required e.g. 'Smoke' (**23**).
- Raise the Testifire head unit up to the detector to be tested, and place it centrally over the detector.
- As the detector enters Testifire, the infrared beam is interrupted by the body of the detector and the chosen test will begin, indicated by the 'Status' LED flashing faster.

Note: It is very important that the detector under test is in the correct position (**22**). Ideally, the bellows should seal against the ceiling surface.

2. Simultaneous Testing (selected tests at the same time)



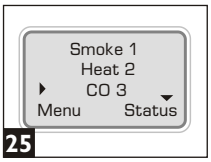
24

In this example, 'Smoke' and 'Heat' are selected as a simultaneous test (**24**).

- Move the cursor to 'Smoke' and press the 'ENTER' key '1' will be displayed alongside 'Smoke'.
- Move the cursor to 'Heat' and press the 'ENTER' key '2' will be displayed alongside 'Heat'. Press 'ENTER' once more to display '1' alongside 'Heat'.
- Repeat the above as required for additional stimuli.
- To delete a test setup, use the 'ESCAPE' key.

1. **Programme the tests:** Smoke 1 Heat 1
2. **Raise Testifire over the detector:** 'Smoke' and 'Heat' are tested at the same time as test '1'.
3. **Lower Testifire from the detector:** The test is completed and ready to test another detector in the same way.

3. Sequential Testing (selected tests, one after another)



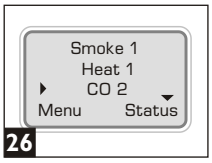
25

In this example, 'Smoke', 'Heat' and 'CO' are selected as a sequential test (**25**).

- Move the cursor to 'Smoke' and press the 'ENTER' key '1' will be displayed alongside 'Smoke'.
- Move the cursor to 'Heat' and press the 'ENTER' key '2' will be displayed alongside 'Heat'.
- Move the cursor to 'CO' and press the 'ENTER' key '3' will be displayed alongside 'CO'.
- To delete a test setup, use the 'ESCAPE' key.

1. **Programme the tests:** Smoke 1 Heat 2 CO 3
2. **Raise Testifire over the detector:** 'Smoke' is tested as test '1'.
3. **Lower for 2-10 seconds, then raise Testifire again:** 'Heat' is tested as test '2'.
4. **Lower for 2-10 seconds, then raise Testifire again:** 'CO' is tested as test '3'.
5. **Lower Testifire:** The test is completed and ready to test another detector in the same way.

4. Combined Simultaneous and Sequential Testing



26

In this example, 'Smoke' and 'Heat' are combined as a simultaneous test followed by 'CO' (**26**).

- 'Heat' and 'Smoke' can be combined as the first operation, followed by a 'CO' test. **Note:** you will need to lower the head unit between each test.
- To delete a test setup, use the 'ESCAPE' key.

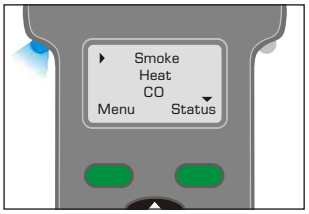
Using these methods, you can programme Testifire to combine tests and continue in sequence.

In this example 'Smoke' and 'Heat' are tested together as test '1' and then 'CO' is tested as test '2'.

Note: 'Clear' (clearing) can also be selected in any of the above operations.

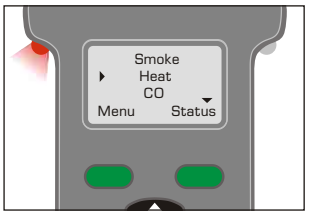
Indicating LED Reference Chart

'Test Type' LED



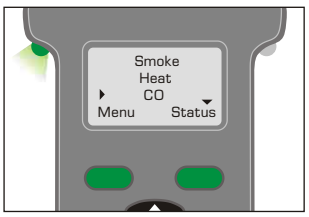
Blue Solid

Smoke Test in progress



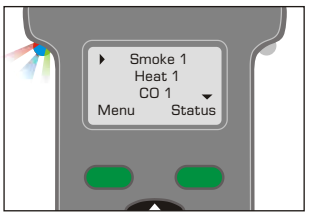
Red Solid

Heat Test in progress



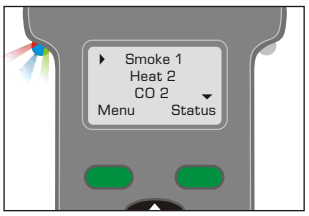
Green Solid

CO Test in progress



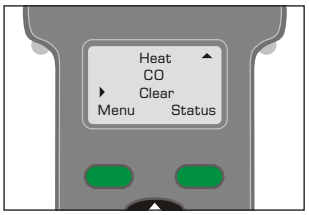
Red/Blue/Green Alternating

Smoke, Heat and CO test in progress at the same time (Simultaneous Testing)



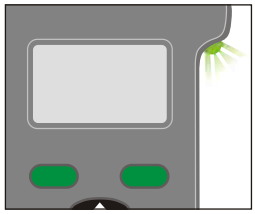
Blue Solid/ then Red/Green Alternating

'Test in progress' portion of Smoke, then Heat & CO combined testing (Sequential Testing)



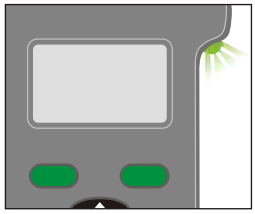
Not Illuminated
Clearing mode in operation

'Status' LED



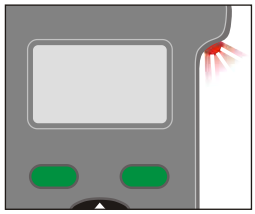
Green Slow Flashing

'STANDBY' Mode



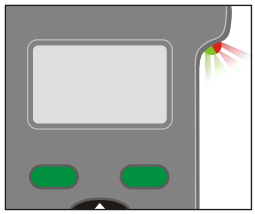
Green Fast Flashing

'OPERATIONAL' Mode
(test in progress)



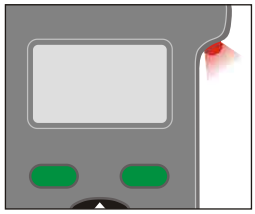
Red Flashing
(slow red flashing in 'STANDBY' mode or fast red flashing in operation)

Battery needs charging - Testifire still operational



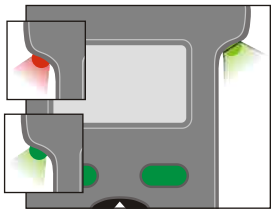
Alternating Red/Green Flashing

'TIME OUT' Indication (after 2 minutes of continuous testing on one stimulus or combination of stimuli)



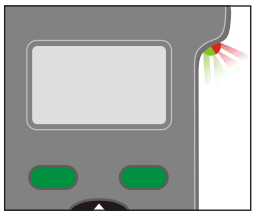
Red Solid

Error - see message on display
(refer to User Manual for a complete list of Indicating LED Error Messages)



Green Solid

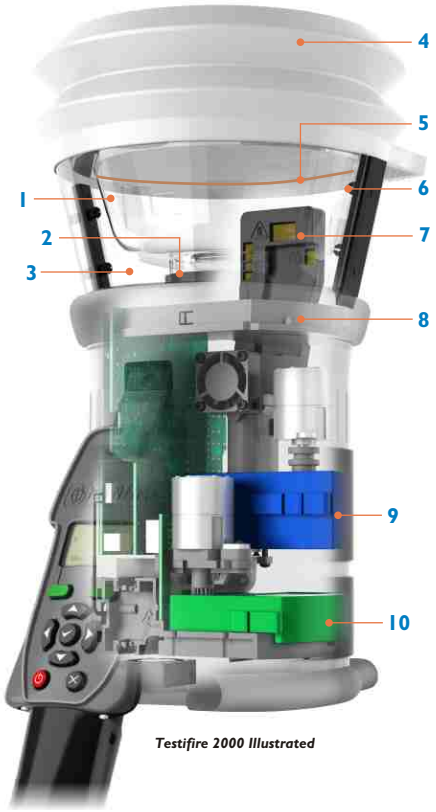
CO Cooling
(Status LED 'blips' red or green. The next test will start when the capsule has cooled sufficiently)



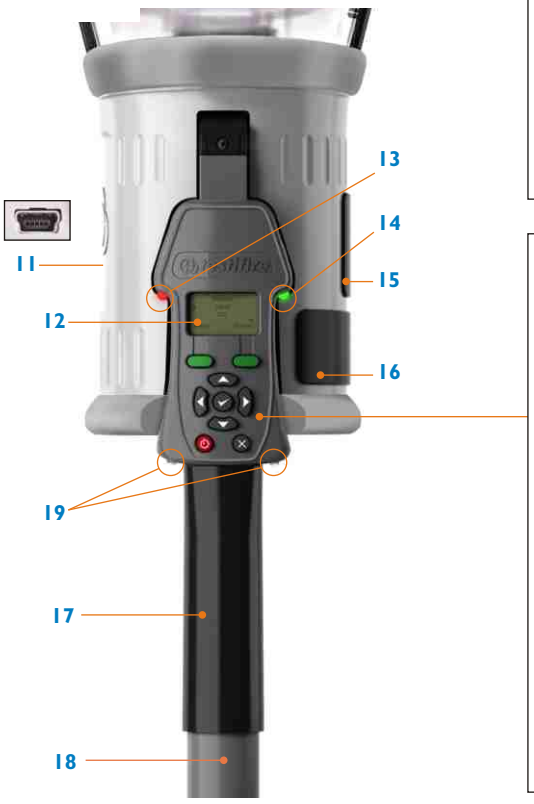
Alternating Red and Green fast flashes with long gaps

"CO Cooling phase" - Indication after a CO test has been carried out. Further CO test cannot be carried out until Status LED shows "STANDBY" mode.

Identification of Parts



Testifire 2000 Illustrated

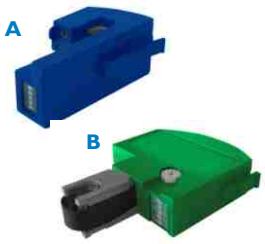


1. Inner Clear Cup
2. Platform
3. Clear Cup
4. Bellows
5. RFID Antenna**
6. Infrared Beam
7. Main Duct for Heat, Smoke and CO*
8. Testifire 100 RFID Bluetooth® Module**
9. Smoke Capsule TS3
10. CO Capsule TC3*
11. USB Port (on rear of unit)
12. User Interface Display (LCD)
13. 'Test Type' LED
14. 'Status' LED
15. Smoke Capsule Access Cover
16. CO Capsule Access Cover*
17. Adjustable Handle
18. Battery Baton
19. Infrared Remote Control Receivers

* Depending on model specification ** Future option

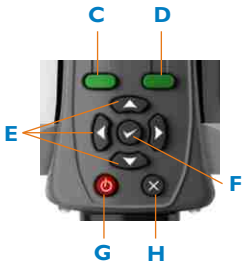
Replacement Capsules

A Testifire Smoke Capsule TS3
B Testifire CO Capsule TC3*



User Interface Keypad

C Menu Key
D Status Key
E Menu Navigation Keys
F Enter Key
G ON/OFF Key
H Escape Key



Infrared Remote Control

Generation of test stimuli starts when Testifire is positioned over a detector and remote controls are not generally required. Certain detectors (such as those with virtual chambers) have no physical features to cause stimuli generation to start. The optional infrared remote control can be used to initiate the test procedure in such situations.

General Safety Information

CAUTION Please refer to your User Manual and take clearnote of all warnings and cautions before using your Testifire.

Testifire has no user-serviceable parts. Do not disassemble. Refer to the manual for Service and Support information.

detectortesters
testing technology from No Climb

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ductchecker™

Duct Detector Test Tool

Instruction Manual

Hand-Held Digital Monometer
Model: 8252

CE

CONTENTS

Congratulations on your purchase of the ***ductchecker™*** Duct Detector Test Tool. This digital manometer is a portable, battery operated pressure measuring device.

The ***ductchecker™*** is ideal for Fire Testing Technicians measuring pressure levels in HVAC/R ducts containing smoke detectors.

INTRODUCTION

✓ The meter will display all LCD segments when it is first turned on for approx. 3 seconds. **Note:** Though you might see DATALOGGER, Y/M/D, REL, AVG, these are not available on this meter.

✓ The LCD is divided into two distinct sections: One large (**primary**) top screen and one smaller right-bottom screen (**relative Clock**). The two display areas keep you constantly updated with the pressure measurements.

✓ The meter measures:
Gauge pressure -
a measurement of pressure that is referenced to ambient pressure.
Differential pressure -
a measurement of difference of two pressures.

✓ The meter has five selectable units of measure: InH_2O, psi, mbar, bar, mmH_2O.

✓ Please check tubing is not leaking or damaged before using.

CONVERSION & RESOLUTION

1mbar=		Resolution
Inch of H_2O	0.401	0.01
psi	0.0145	0.004
mbar	1	0.1
mm of H_2O	10.2	1

MANOMETER QUICK START

✓ Unscrew the battery compartment on the rear of instrument and fit PP3 (or equivalent) battery. Replace the cover and secure with the screw.

✓ Press ⏻ to switch the instrument on.

✓ Press UNIT to select the unit of pressure measurement required. Zero by pressing HOLD and hold for 3 seconds. The instrument now reads gauge pressure.

✓ Press DIF for differential pressure measurement.

✓ Press HOLD to freeze reading. Press HOLD again to cancel feature.

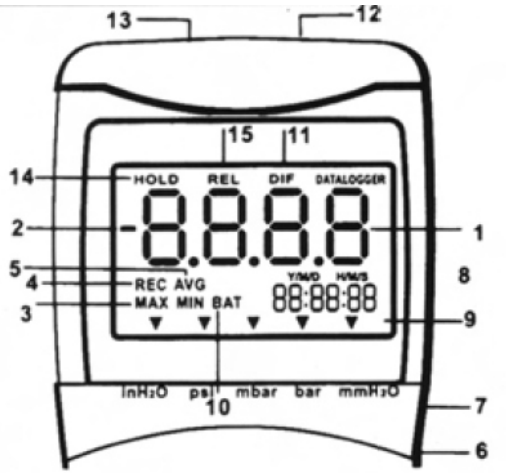
✓ Press REC to start **clock**. Press REC again to see **time** (since start of recording). For **MAX** reading press REC again to see **time** (since start of recording). For **MIN** reading pressing REC again returns to **real time recording mode**.

✓ Press and hold REC for 3 seconds to turn **clock** feature off.

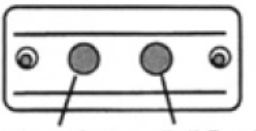
Note:
Clock feature available with gauge pressure only not differential. The instrument will automatically switch off after 20 minutes unless sleep mode is disabled, see page 5 AUTO POWER OFF.

✓ Press for display backlight - illuminates for approximately 30 seconds and automatically switches off.

CONTROL & INDICATORS



1. Primary Data Screen displays pressure value.
2. **"-"** Minus pressure display.
3. **MAX MIN** Pressure recorded.
4. **REC** Starts recording mode and displays max/min pressure recorded.
5. **AVG** Average records (N/A).
6. **DC** Power in Jack.
7. **RS232** Output port
8. **H/M/S 88:88:88** Displays time for Hour/Minute/Second.
9. ▼ Pressure unit indication
10. **BAT** Battery low indicator.
11. **DIF** Differential pressure mode
12. **"+"** Positive pressure connection
13. **"-"** Negative pressure connection
14. **HOLD** Freezes pressure reading.
15. **REL (N/A)** Establish a relative zero for the primary screen information.

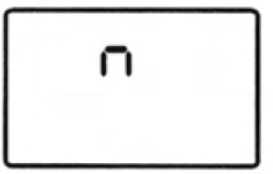


AUTO POWER OFF (SLEEP FUNCTION)

This instrument will shut off automatically after approx. 20 minutes for every power on. For recording or operating over longer periods of time, you can disable the sleep mode by pressing ◐ and HOLD simultaneously before power on.

An **"n"** will appear in the middle of the screen at which time you can release the HOLD button (see Fig. A). The disable sleep mode will be invalid after power on.

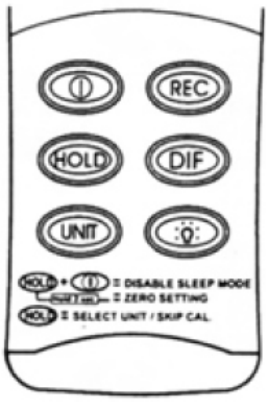
Fig. A →



MODE OPTIONS

Delete and replace with programmable user selectable start-up mode. The display will default to the mode last used.

The following table lists the modes of operation that can be invoked by pressing the button indicated.



Turns instrument on (default setting) and off.

REC Press momentarily and relative clock starts in the lower right screen. **REC** is displayed in the middle left of screen (Fig. B). Other button functions are locked out except **Power**, **Unit** and **Backlight**.
Press momentarily again and the unit cycles through **MAX** (Fig. C) and **MIN** (Fig. D) and back to current pressure; the record mode is displayed on the LCD. Press and hold REC for 3 seconds to turn off the record function and return to normal mode.

Fig. B →

Fig. C →

Fig. D →

(HOLD) Press momentarily to freeze the pressure recording (Fig. E).

Fig. E →

(DIF) Press momentarily, DIF appears on top of the LCD and the display indicates the relative zero (relative zero causes the value of the display to show as **"0.0"**) - only the amount of pressure change will be indicated. Press momentarily again and the unit returns to the normal mode of pressure differential (see Fig. F).

Fig. F →

Differential Pressure: a measurement of the difference between two pressures, i.e. use differential pressure sensor to measure gauge pressure by leaving one process connection open to the atmosphere and connecting the second sensor port to your system.

(UNIT) Press momentarily and the unit will cycle through **"InH$_2$O"**, **"psi"**, **"mbar"**, **"mmH$_2$O"** which are indicated on the bottom of the display (see Fig. G & H).

Fig. G →

Fig. H →

(☼) Press momentarily and the backlight illuminates for approx. 30 seconds then turns off automatically. Or press momentarily to decrease the figure when calibration is being performed.

MAINTENANCE

✓ The meter is calibrated in-house before shipping.

✓ When properly maintained, the meter will maintain its accuracy to specification. To ensure your meter is performing at its peak, send it to the factory or a qualified instrument calibration facility for annual calibration.

✓ Recommended - always set to zero before measurement. Refer to the zero setting procedure on page 11.

Cleaning:

Use a damp cloth and mild soap to clean the case of the Monometer. Do not use harsh detergents or abrasives as these may mar the finish or damage the unit's case with an adverse chemical reaction.

CALIBRATION MODE

Calibration mode is only applicable for a standard manometer calibrator or any qualified calibration facility for annual calibration.

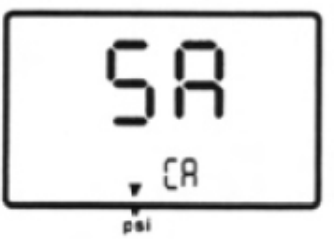
1. Manually set the display to zero (no pressure applied to the connector), refer to the manual zero procedure (see page 11).

2. Turn the meter off.
3. Press REC & ◑ simultaneously. **"CA"** appears on the display. (see Fig.1) and the meter enters the calibration mode. Make sure the unit is set on **"PSI"** to start positive (**+**) pressure calibration.

Fig. I →

4. The meter has defaulted to 1.6 psi calibration point, the adjustable pressure range is from 1.5 to 1.7 psi. If calibration pressure source is not 1.6 psi, increase by pressing DIF key, or decrease by pressing ☼ key to set calibration point as required.
5. Save the calibration point by pressing REC key. **"SA"** and small **"CA"** appears on the display (see Fig. J). After 2 seconds, the meter auto-skips to the negative pressure (**-**) point for ther next calibration mode.

Fig. J →



6. Follow the same procedure as in step 4 for the negative pressure calibrator point. The LCD now displays **"- 1.600"** and a small **"CA"** (see Fig. K). Do the necessary calibration figure referring to your pressure standard if needed.

Fig. K ➔ 

7. Again save the calibration point by pressing (REC) key, **"SA"** and **"CA"** appears in 2 seconds and then pressing (UNIT), **"End"** and **"CA"** appears in another 2 seconds. The meter turns back to the normal mode (see Fig. L).

Fig. L ➔ 

If you can't save by pressing the (UNIT) key, i.e. no **"SA"** appeared, please check: (a) the calibration pressure source is between 1.5 and 1.7, or (b) if you entered the correct positive pressure (**+**) or negative pressure (**-**).

If you want to skip positive (**+**) calibration when in calibration mode, press (UNIT) to skip to negative (**-**) calibration point.

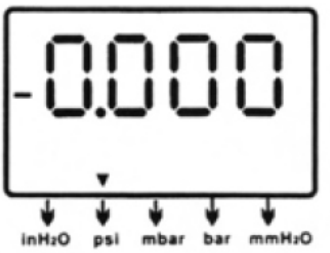
Calibration point reference

psi range	Calibration point(±)	Recommended (±)
0 ~ ±2	1.6	1.5 ~ 1.7

MANUAL ZERO SETTING

When you set the display to zero (no pressure applied to the connector), press HOLD for 2 seconds. Now the meter displays **"-0.000"** from right to left (see Fig. M), then the LCD display shows a normal mode.

Fig. M →



TROUBLESHOOTING

? **Power on but no display.** Check the battery connections. Replace with new battery or attach optional AC adaptor.

? **BAT indication.** Replace with a new battery when LCD displays **BAT** at the middle bottom.

? **No display.** Make sure battery is not empty. If the display disappears, check sleep mode is active. Refer to the disable sleep mode function for a long time on page 4. Or check the tubing is connected to the meter tightly.

? **Err.1.** For the pressure value exceeding the maximum range, **"Err.1"** appears on the display (see Fig. O). Do not exceed above the rated pressure range of Manometer. The sensor will be damaged.

Fig.O →

? **Err.2.** For the measurement of pressure less than minimum range, **"Err.2"** will appear (see Fig. P).

Fig. P →

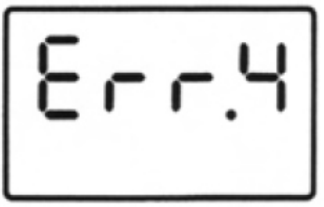
? **Err.3.** For a differential pressure value larger than maximum display, **"Err.3"** appears on the display (see Fig. Q).

Fig. Q →

? **Err.4.** When you set zero, make sure you have disconnected the tubing. If **"Err.4"** appears on the display, it means the Manometer is damaged (see Fig. R).

Note: **"Err.4"** will also appear if the tubing is connected during zero setting.

Fig.R →



? E1OL or E2OL. When you see these errors while operating the RS232 software, it means the pressure source is less than or over the range of the instrument.

REPLACING THE BATTERY

Replace your 9-volt battery when:

✓ The **BAT** icon appears on the right of the screen.
✓ The meter will not power on.
✓ Use of the backlight causes the **BAT** icon to appear.

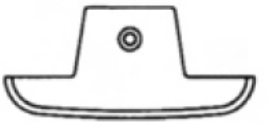
Even if the battery was recently replaced, check its voltage level if you get no response from the instrument.

To replace the battery:

1. Remove the tubing from the instrument.

2. Lay the instrument face-down on a clean, flat surface.

3. Remove the battery cover.



If you do not intend to use the instrument for a month or more remove the battery. Do not leave battery in the instrument.

OPERATING CONDITIONS

- ✓ Compensated temperature range: 0~50°C (32~122°F)
- ✓ Operating temperature range: 0~50°C (32~122°F)
- ✓ Storage temperature range: -20~60°C (-4~140°F)
- ✓ Operating Humidity Max. 80% RH
- ✓ Power: One 9.0 volt battery
- ✓ Exceeding maximum pressure will cause permanent sensor damage.

MATERIAL SUPPLIED

This package contains:

- ✓ The Manometer
- ✓ Battery (9.0 volt)
- ✓ Operation manual
- ✓ Connection tube 6mm (ID) x 9mm (OD) x 500mm length x 2 pcs.

OPTIONAL ACCESSORIES

- ✓ RS232 software CD with D-sub connector
- ✓ Rubber boot

SPECIFICATION

	Pressure
Range	0~ ± 138 mbar = 0~ ± 55.4 inH2O = 0~ ± 1410 mm inH2O = 0~ ± 0.138 bar = 0~ ± 2 psi
Resolution	See Page 2 data sheet
Accuracy	±0.3% of full scale at ±25°C
Dimensions	72 x 182 x 30mm (meter)
Unit Weight	Approz. 220 gram (with battery)
Response time	0.5 seconds
Format	Baud Rate: 2400 bit/sec Data Bit: 8, Stp Bit: 1 P XXXXX, P - XXXXX (unit)

RS232 DATA OUTPUT

This Manometer can link with a personal computer to capture online data, display pressure records with real-time output. You can retrieve files, save the data for operating data analysis, record statistics, multi-file display on the screen etc. - versatile functions of your choice.

Connection Procedures:

1. Plug the optional accessory RS232 cable into the DC jack port (at the right side of the meter).
2. Insert the D-sub 9P type connector into the computer's Com. 1 or 2 port.
3. Start the set up of RS232 software by inserting the CD-ROM
4. When installing the RS232 software, please follow the operation manual procedure in the software package.

Data Logger
Retrieve File
Save File
Com.Port
Statistics
Print Graph
Help
Logger Setting
Graph Chart
Sample Data
8,000
Sample Rate(Sec.)
Recording
Trigger
Start
End
EXIT
Y OFFSET (DIV)
Y GAIN (DIV)
Pressure
-54.500
Alarm High
Alarm Low
Alarm SW
Uncertainty
0.00
No. of Records
Display Range

ductchecker™

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