SHAW
MOISTURE METERS

Model SDHmini-Ex

Dewpoint Meter

Instruction Manual

3001 SDHmini-Ex User Manual - Iss 3

SHAW
MOISTURE METERS

EC Declaration of Conformity

We	Shaw Moisture Meters
Of	Len Shaw Building, Bolton Lane, Bradford, England, BD2 1AF
Declare that	
Model Name:	Dewpoint Hygrometer SDHmini-Ex
ATEX	Ex II 1 G Ex ia IIC T4 Ga Ex II 1 D Ex ia IIIB T60°C T∞80°C Da -20°≤Ta +50°C
U/L	Class 1 Div 1 Groups A, B, C and D T4 -25°C ≤Ta +50°C
Description:	Battery powered moisture analyser comprising a sensor contained within a drying chamber mounted on a transportable instrument casing.

Conforms to the following directives:
2014/34/EU ATEX Directive
2014/30/EU The Electromagnetic Compatibility Directive

And has been designed and manufactured to the following standards:
EN 60079-0:2012 Electrical apparatus for potentially explosive atmospheres. General requirements
EN 60079-11:2012 Electrical apparatus for potentially explosive atmospheres intrinsic safety 'i'

I hereby declare that the aforementioned equipment has been designed to comply with the relevant sections of the above referenced specifications.

11 August 2016
Bradford UK

Andrew Coulton
Calibration & QA Manager

Part Ref	Full Title	EMC	ATEX	CERT No.
SDHmini-Ex	SHAW DEWPOINT HYGROMETER	Y	Y	Baseefa15ATEX0212 IECEx BAS 15.0148 UL E477338

Notified body for ATEX: SGS Baseefa Ltd., Rockhead Business Park, Staden Lane, Buxton, Derbyshire SK17 9RZ
Notified body No.: 1180

Notified body: UL (Underwriters Laboratories), 220 Cygnet Court, Centre Park, Warrington WA1 1PP
Notified body No.: 0843

CP12A issue 4

CE 1180

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1.0 Unpacking Your Shaw Moisture Meters SDHmini-Ex

Please examine the SDHmini-Ex package for any damage or mishandling. If any damage is evident please notify the carrier and the Shaw Moisture Meters representative from where this unit was purchased.

You should have received (if ordered):

- 1 model SDHmini-Ex instrument
- 1 carry case
- 1 Allen key
- 1 instruction manual
- 1 pressure dewpoint circular calculator
- 1 two metre length of PTFE tubing
- 1 USB charging cable

If anything is missing please contact your distributor immediately.

1.1 General Description

The SDHmini-Ex is an intrinsically safe, micro-controller based battery operated dewpoint hygrometer with state of the art features and enhancements with support of USB and Bluetooth interfaces for communicating with PC and also support for thermal printer over Bluetooth.

The SDHmini-Ex is a battery powered instrument. It is a fully self-contained unit incorporating the moisture sensor, signal conditioning circuitry, memory management, graphics display, membrane keyboard, real time clock, on-board battery and charger circuit.

The SDHmini-Ex operation is controlled by a user-friendly software interface incorporating multiple menus, hot key combinations, information displays and control functions.

The GUI features three main viewing screens, digital, graphical (historical readings in a scrolling strip chart) and a meter (a traditional moving coil). There is also a secondary display in the top right which allows display of readings in alternative units of measurement.

The unit operates with the following 10 language options: English, German, French, Spanish, Portuguese, Russian, Italian, Chinese, Japanese and Korean.

A full colour graphics LCD display with 320 x 240 resolution landscape and a 6 key input including an on/off facility.

A single USB port allows

- Charging of the battery (Li-ion) when connected to PC or dedicated power supply
- Uploading of new firmware to the unit
- Uploading of calibration and setup data from dedicated PC software
- Downloading logged data files and real time data from the unit

The displayed units can be changed on both the primary and secondary displays for the selectable moisture unit e.g. °C, °F, g/m^3, ppm(v), ppm(w), ppb and lbs/MMscf.

The inbuilt memory, stores in excess of 150,000 readings including moisture and pressure compensated moisture readings with user selectable logging intervals from five seconds to one hour and real-time data logging graphical formats. Data is stored under customer generated file names and stored data files can be reviewed graphically on the unit. The rechargeable battery has in excess of 150 hours logging capability on a minimum logging interval and is fully recharged in 12 hours.

1.2 Ranges

SDHmini-Ex(r):	**Range**
Purple (P):	-100 °C to 0 °C dewpoint, 0 - 6000 PPM
Silver (S):	-100 °C to -20 °C dewpoint, 0 - 1000 PPM
Red (R):	-80 °C to -20 °C dewpoint, 0 - 1000 PPM and 0 - 10 on TR version
Grey (G):	-80 °C to 0 °C dewpoint, 0 - 6000 PPM and 0 - 10 on TR version
Blue (BL):	-80 °C to +20 °C dewpoint, 0 - 23,000 PPM (ManualCal)

2.0 Hazardous Area Use - Safety

The SDHmini-Ex is certified intrinsically safe to:

Ex ia IIC T4 Ga & Ex ia IIIB T60°C T_{50}80°C Da

UL Class I Div 1 Groups A, B, C and D T4

The equipment complies with the requirements of:

IEC 60079-0:2011 and IEC 60079-11:2011
UL 913 and CSA 157

It is the responsibility of the user to ascertain the suitability of the SDHmini-Ex for use in hazardous areas. Risk assessments should be carried out prior to use, taking into account the SDHmini-Ex certifications, location and the gas being monitored.

2.1 Bluetooth Certifications

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment - Contains FCC ID:QOQWT41.

This device complies with Industry Canada licence-exempt RSS standard(s) - Contains IC:2153A-BGTWT41.

WT41 meets the requirements of the standards below and hence fulfils the requirements of EMC Directive 89/336/EEC as amended by Directives 92/31/EEC and 93/68/EEC within CE marking requirement.

WT41-E has modular certification with certification number R 209-J00047.

2.2 Symbols Table

	Battery Note: Please refer to section 2.3
	Rating of instrument is less than 1 W in operation. Charging voltage is 5 V nominal. Charging input is however additionally protected to Um 250 Vrms.
	The symbol indicates that the device contains a battery which may be charged via the neighbouring connector.
	Pressure Note: Please refer to section 2.4

2.3 Lithium-ion Cell - Battery

The SDHmini-Ex is powered by a single lithium-ion cell.

The cell is not field replaceable by the user as it is completely enclosed within the instrument. However, the cell may be exchanged by an authorised agent who has received the necessary training, support systems and accreditation. It is recommended to only use the USB power supply supplied with the instrument.

Please note: Charging of the SDHmini-Ex should only be carried out in the SAFE AREA.

It is recommended that the SDHmini-Ex be put on charge overnight when the unit is first received.

To attain maximum cell life the SDHmini-Ex should always be charged at room temperature. The discharging cell life (hours of use from a fully charged cell) will reduce when used in cold conditions.

2.4 Pressure Exposure

The maximum pressure to which the telescopic measuring head is exposed should not be more than

0.3 bar, 4 psi

Exposing the measuring head to higher pressures may damage the instrument and result in injury to the operator or other personnel in the area.

3.0 Installing the Air/Gas Sampling System

The *Piping Installation Schematic* diagram (see section 3.2) shows all components, which could be used in a dry gas measurement application. Although not all the items shown will be required for every installation.

The SDHmini-Ex should be placed on a stable surface prior to connecting to the sample pipework. Care should be taken to ensure that the sample presented to the SDHmini-Ex is not contaminated with any component that will damage, contaminate or affect in a way that will impair the unit's accuracy.

The flow rate, although not critical to the sensor measurement, should be low enough to avoid abrasion to the sensor surface without being so low as to extend the SDHmini-Ex response time to an unacceptable level. In general, a flow rate of between 2 and 5 litres/min at NTP will give the right balance.

The SDHmini-Ex is designed to operate at atmospheric pressure with a maximum of 0.3 bar.

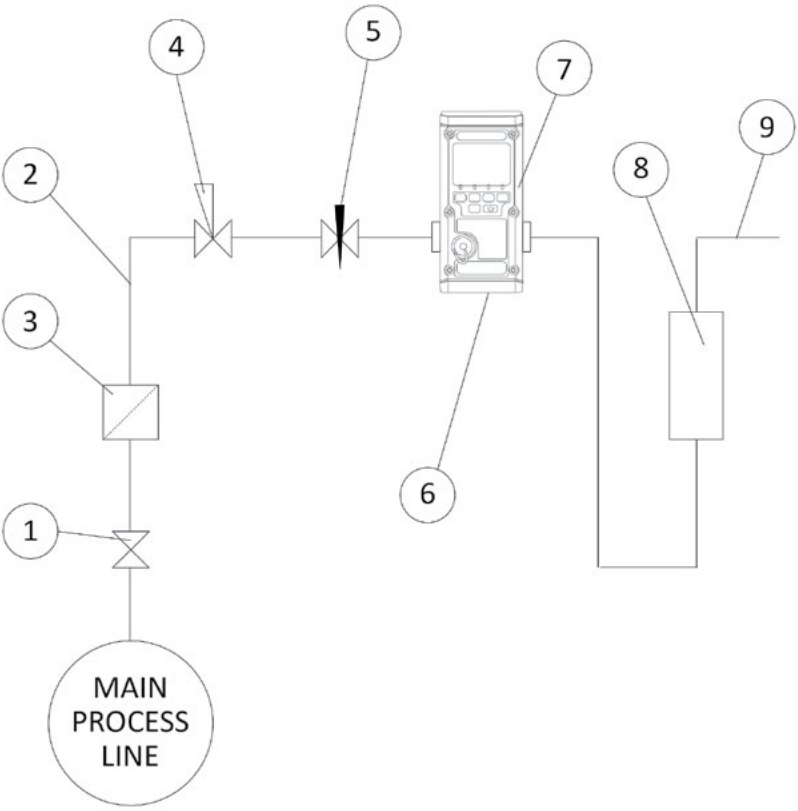
3.1 Gases to Avoid

The moisture sensors are suitable for any different industrial and research applications. Most gases can be checked for their moisture content with no need for the calibration to be altered when changing between different gases, as the sensor operates only with reference to the water vapour content.

There are however, some gases that must be avoided as they are not compatible with the material of construction of the sensor. Ammonia (NH_3), Ozone (O_3) and Chlorine (Cl) must be avoided at all times, even in small quantities. Hydrogen Chloride (HCl) also attacks the sensors very quickly. Some, less aggressive acidic gases such as Sulphur Dioxide (SO_2) can be monitored as long as the moisture content is low, generally less than 100ppm(v). If in doubt, please ask your supplier.

Sulphur Hexafluoride (SF_6) has no effect on the sensor. If the gas has been exposed to arcing, however, it is possible that various acidic species will have been formed that will corrode the sensor. When testing SF_6 that may have been arced, therefore, an acidity test should be carried out first; if the gas proves to be acidic then the moisture test should not be carried out.

3.2 Piping Installation Schematic



Notes

a. The sample point should be on the upper surface of the horizontal pipe, or from a vertical section of pipe, wherever possible.

b. The sample tube should run upwards from the sample point. If this is not possible, then an inspection port or drain tap should be installed at the lowest point in the sample system.

3.3 Piping Schematic Component Index

1. **Sample Isolation Valve** - This is a recommended item as it allows access to the sample system without interrupting the main process line.
2. **Sample Tube –** This should be stainless steel for dry air or gas applications but copper or carbon steel can be used where wetter gases are to be measured. If any section of the sample tube must be flexible then PTFE should be used. In most cases, 3 mm OD (⅛") is sufficient as it provides good system response time with minimum flow. 6 mm OD (¼") tube can be used where pressure drops across the 3 mm tube are too high.
3. **Filter Unit –** A filter unit is recommended when the samples are likely to contain particulate matter. If the air/gas sample contains heavy hydrocarbon condensate, the filter must be of the coalescing type with a drain. The filter unit should be positioned as close to the sample point as practical.
4. **Pressure Reduction Valve or Pressure Regulator –** the sample is measured at atmospheric pressure requiring that valve 4 is fitted to the system.
5. **Flow Control Valve.**
6. **Sample Connection.**
7. **SDHmini-Ex.**
8. **Flow Indicator –** The recommended sample flow is 2 to 5 L/M.
9. **Sample Exhaust –** The exhaust is vented to atmosphere or returned to an atmospheric pressure line.

4.0 Purging the Sample Connection

Refer to the *Piping Installation Schematic* in section 3.2.

It is advisable to carry out an initial purge of the sample loop before connecting the SDHmini-Ex, in order to avoid the possibility of sensor damage on start-up.

Open the sample isolation valve (1) slowly, until there is a small flow of air/gas at atmospheric pressure from the pressure reduction valve (4) into SDHmini-Ex line. Allow the air/gas to exhaust through the sample connection (9).

The SDHmini-Ex is not flow sensitive, however, the sample flow needs to be enough to purge the sensor head effectively, so anything less than 1 litre/min would mean that the instrument would take too long to settle to a stable reading. The flow should not be so high that the gas velocity could physically damage the sensor or cause back-pressure in the sensor head, so should not exceed approximately 10 litres/min.

Allow this purge to continue for two minutes to remove any residual moisture from the sample pipe work and components. Check that no liquid or particulate contamination, which could damage the sensor, is passing through the sample pipe. Directing the sample onto a piece of white paper (such as a filter paper) will make it easier to see any dust or oil mist in the sample.

4.1 Sampling Information

Refer to the *Piping Installation Schematic* in section 3.2.

The SDHmini-Ex sensor will respond to the water vapour pressure of a gas in contact with it. It is important to ensure that the gas passing through the sensor head is the same as the gas being sampled.

4.2 Sample Connections

The SDHmini-Ex is supplied with two connections: a “fir tree” on one side and a Swagelok compression fitting for ¼”, ⅛”, or 6 mm OD pipe (as specified on your order) on the other. Either can be used as the inlet connection (6).

PTFE and stainless steel are recommended materials for sample pipes. Some specialist flexible tubing may be suitable as sample pipe but common flexible tubing such as PVC, nylon, polythene or rubber, should not be used, as they are permeable and water vapour from the atmosphere will diffuse through them into the sample gas.

A 2 m PTFE sample pipe is supplied for use with the “fir tree” connection. The first time this is used it is advisable to warm the end that will go over the “fir tree” for a few seconds with a heat source to soften it slightly, which helps to get a gas tight seal.

4.3 Sample Conditioning

The main principle when considering the presentation of the gas sample to the SDHmini-Ex dewpoint meter is to keep the sample system as simple as possible and of minimum swept volume, so that it has the least possible influence on the gas sample.

5.0 Normal Operations

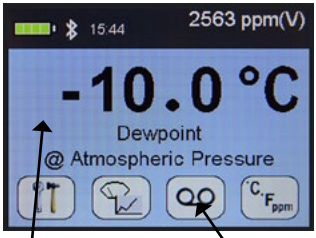
5.1 Powering On/Off

On power up, the SDHmini-Ex briefly displays a splash screen showing instrument status, error information and firmware version number.

To turn off the SDHmini-Ex press and hold.

5.2 Graphical Viewing Options

The start up screen is soon replaced by the normal measurement mode screen (see below) displaying the current moisture measurement in a variety of views. The last used or last selected mode will be utilised automatically.



Top Bar
Battery Status - Bluetooth Status - Time

Top Bar
Secondary Display or Measurement Value

Viewing Portal
Main display resides here but can also show alternative Measurement Data, Information Screens, Configurations and Logged Data in a variety of formats.

Button Icon Area
These are soft keys which are always visible to assist users in navigating through the graphical screens.

5.3 Display Options

The display can be changed by pressing the following keys to cycle through all of the graphical views.

Here is a view starting as a digital number followed by simulated strip chart and moving coil instruments.

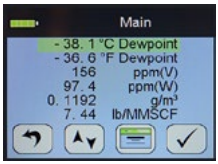
The digital display mode has the benefit of showing the moisture measurement in main choice of engineering units but also a secondary display with perhaps alternative engineering units. This mode also allows application of pressure dewpoint to evaluate the measurement in other samples pressures.

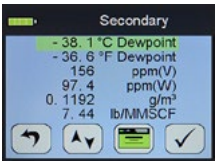
5.4 Choice of Units

To choose the engineering units to be displayed, select the units key from the main digital view.

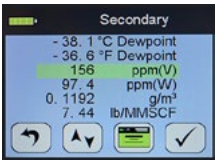
You will be presented with the following screens to select engineering units for the main and secondary displays. You may toggle between adjusting the main and secondary displays by pressing the key. In normal measurement mode. The secondary display is the measurement displayed in the top bar on the right hand side (**A**). It allows alternative engineering units or concentrations to be displayed alongside those chosen in the main display.

Use the ▲▼ key to move to the desired measurement type and press ✓ to select it. Pressing ↩ will exit the current screen without making any further changes.





Here the secondary display is being changed to ppm(v) engineering units.



Please note: when you change the display to either the moving coil meter or the strip chart the secondary engineering units display is replaced with the primary units (**B**).

This continues to allow high precision measurement whilst having the benefit of the graphical display.

6.0 Calibration

6.1 Calibration Checking

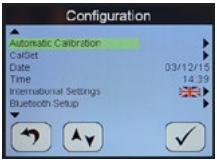
Field calibrations of the SDHmini-Ex may be performed periodically, every two to three months, to ensure accuracy between laboratory calibrations by checking the span of the instrument and correcting for any deviation. These functions can be used to verify operation of the SDHmini-Ex if confirmation of an unexpected result is required.

This may be accomplished by two similar in built calibration functions, namely *AutoCal* and *CalSet*.

6.2 Auto Calibration (AutoCal)

The *AutoCal* facility uses the fact that each sensor is designed and manufactured to give no further increase in response when it reaches its maximum moisture level. **For example** a SDHmini-Ex with a full scale value of 0 °C dewpoint will read 0 °C dewpoint when exposed to a gas with this moisture concentration and will continue to read 0 °C dewpoint as the moisture concentration rises above 0 °C dewpoint.

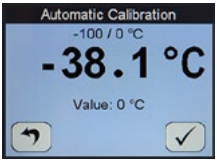
The SDHmini-Ex can therefore be adjusted to read 0 °C dewpoint on any gas with a moisture concentration wetter than 0 °C dewpoint, ambient air for instance, thus setting the span to match the original calibration.



Select *AutoCal* from the *Setup Menu*.

Extend the desiccant head noticing that the value of the full scale moisture level has already been automatically preselected as a target of 0 °C.

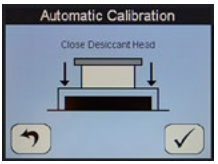
Press ✓.



The SDHmini-Ex will display a moving bar until it assesses that the sensor has stabilised (up to ten minutes).

The SDHmini-Ex will now display the full scale value of the unit, either -20 °C or 0 °C depending on the sensor range.

Close the desiccant head when instructed to do so and press ✓.



Pressing ↶ during the *AutoCal* aborts the process.

The value present at the start of the aborted *AutoCal* process is reinserted.

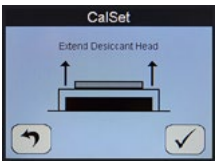
The SDHmini-Ex will return the instrument to normal measurement mode.

Note: Avoid carrying out the *AutoCal* procedure on a SDHmini-Ex with a full scale value of 0 °C dewpoint on days when the ambient may be below this value, for example a dry day when the ambient temperature is below approximately 12 °C.

6.3 CalSet

The unit may be checked against a known moisture level, for example from a moisture generator or other reference standard, such as a chilled mirror hygrometer or a psychrometer using the function *CalSet*.

Extend the desiccant head and press ✓.



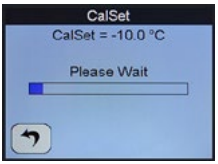
Whether the instrument is being checked against the measured ambient level or against a known calibration standard from a moisture generator, ⟲ and ▲▼ are used to set the value accordingly.

Selecting -10 °C for instance involves changing the sign and number by use of both keys.

The entered *CalSet* value must not be a pressure compensated one.

Press ✓ when done.

The SDHmini-Ex will display a moving bar until it assesses that the sensor has stabilised (up to 10 minutes).

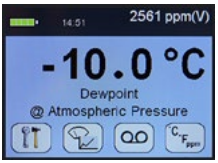


The full scale value, -10 °C dewpoint, is now displayed.

Press ✓ when complete.

Close the desiccant head when instructed to do so and press ✓.

Pressing ↶ during *CalSet* aborts the process.



The value present at the start of the aborted *CalSet* process is reinserted.

The SDHmini-Ex will return to the normal operational mode.

6.4 Calibration Notes

If the instrument fails calibration, a message will be displayed on the screen until acknowledged by the user, e.g.

AutoCal Failed
Sensor Open Circuit
or
AutoCal Failed
Sensor Short Circuit

This will mean replacing the sensor or its interconnecting cable in some cases.

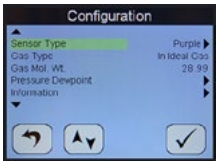
The entered *AutoCal* value must not be pressure compensated.

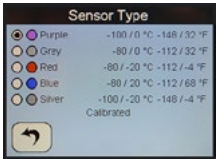
7.0 Additional Information

7.1 Additional Sensor Settings

On the configuration screens there exists a collection of measurement settings associated with the sensors and its environment.

7.2 Sensor Type

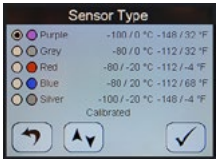


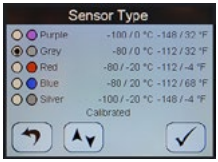


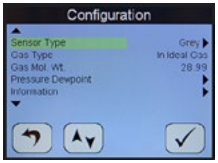
Here you may view the type of sensor installed in the SDHmini-Ex and its range.

If you receive another sensor type (colour) then you may perform a field change of the sensor range as shown in the following.

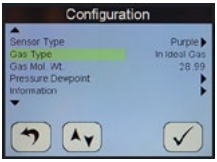
Follow the on screen instructions.

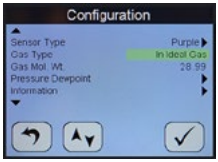


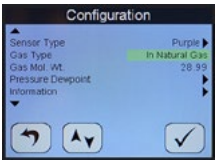


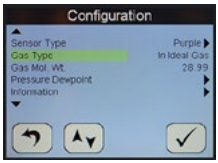


7.3 Selecting Gas Types









7.4 Selecting Gas Molecular Weights

8.0 Pressure

This sub-menu has, for both the primary and secondary displays, five options allowing the user to select either *atmospheric pressure* or one of four *pressure engineering units* and *applied pressure*.

When this function is selected, the main and secondary display screens will display the pressure at which the dewpoint reading is calculated.

The SDHmini-Ex requires that a numerical pressure value be entered in the selected units at the bottom of the units selection section.

Warning: This function is purely an internal calculation and **DOES NOT** allow an elevated pressure to be applied to the measuring head.

9.0 Non Measurement Related Configuration Functions

9.1 Changing the Date

In order to change the present date press the arrow key to select the *Date* function from the *Configuration* menu. Press ✓.

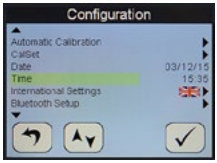
Use ▲▼ and ⟲ to change the date.

Here for example the date is changing from 06/03/15 to 06/04/15.

Press ✓ to enter new date or ↩ to abort changes.

9.2 Changing the Time

In order to change the present time press ▲▼ to select the *Time* function from the *Configuration* menu.



To change the time use ▲▼ and ⟲.

Here for example the time is changing from 10:48 to 11:48.

Press ✓ to enter new time or ↩ to abort changes.

9.3 Changing International Settings

In order to change the settings for *Language*, *Date Format* and *Numerical Delimiter,* use the selection cursor [▲▼].

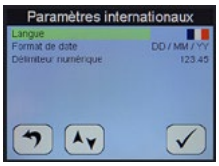
Select *International Settings* from the *Configuration Menu*.

To change the *Language* option select [✓].

The language choice area is highlighted. A flag of a country most associated with one of the pre-installed languages indicates which language is currently selected. The SDHmini-Ex operates with the following 10 language options: English, German, French, Spanish, Portuguese, Russian, Italian, Chinese, Japanese and Korean.

Use the [▲▼] to select the flag required.

And [✓] to accept the choice.



The *Date Format* i.e. DD/MM/YY or MM/DD/YY is also chosen from within the *International Settings* menu.

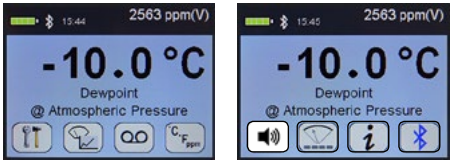
And finally, numbers can be presented 123.45 or 123,45.

Note: These settings are carried through to any data files and printer outputs where appropriate.

10.0 Hotkeys

To access the hotkeys from the main screen, press key 5 on the keypad.

The four soft keys are replaced by a new set of hotkeys for a short while. These are available for rapid access to certain areas of the menu structures or functions.



Turns ON and OFF the inbuilt sounder.

Accesses the alternative moving coil graphical viewing screen

Takes the user to the *Information* screen

Takes the user to the *Bluetooth Setup* screen

If the SDHmini-Ex is connected to a PC then the second hotkey is replaced by an SD card symbol

11.0 Bluetooth Setup

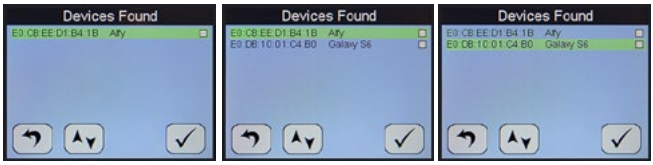
In the *Configuration* menu select *Bluetooth Setup.*
Press ✓

And again, to search for Bluetooth devices.

Ensure that the Bluetooth device is switched on. If not, go back and repeat until the device is found using the ↶ key.

You may not find any devices and may have to restart the search.

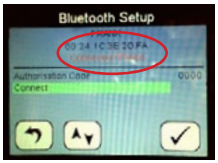
If more than one device is found, (as per example image shown) select the device you wish to pair with using ▲▼ and press ✓ to begin the pairing process.



Enter the pairing authorisation code for the device and press ✓ to connect.

The message will say *Connecting* and finally *Connected*.

If a problem exists then the message will turn red and say Connection Failed.



This maybe due to:

- An incorrect authorisation code.
- The external device has powered down.
- The external device is out of range.
- The external device is not suitable to pair with.

Initially, the devices will be Bluetooth printers.

As confirmation, you may print a test page of the instrument settings to the printing device.

You may also *Disconnect* from a device.
Leaving the message status now empty.

12.0 Desiccant and Head Seal Replacement

- Unscrew the four handle retaining screws using a hex socket drive.
- Unscrew the four posidrive countersunk screws which hold the retaining ring to the SDHmini-Ex.
- The desiccant filled desiccant chamber can now be removed from the sample chamber by fully retracting the desiccant chamber. Gently pulling on the desiccant chamber a little more, will pull the retaining ring out of the sample chamber. The sample chamber is still retained within the body of the SDHmini-Ex.
- Carefully place the knurled section of the desiccant chamber top section with the desiccant base assembly uppermost.
- Fully unscrew the desiccant head base assembly turning it anticlockwise. The desiccant head base may require slight loosening by placing in a soft jaw vice before this step is carried out. Do not fully unscrew with desiccant chamber base section at the bottom, as this will spill desiccant.

Only use soft jaws. Do not use tools or vice with hard jaws.

- There is no need to remove the retaining ring from the desiccant chamber top section except perhaps to change an O-ring.
- Dispose of used desiccant and re-fill with new, up to a level of 3 mm from the bottom of the screw thread.
- Insert the desiccant chamber base assembly back into the refilled desiccant chamber top section. Remember to ensure that the retaining ring is in place and in the correct orientation prior to reassembly by re-tightening the threaded parts.

Only use soft jaws. Do not use tools or vice with hard jaws.

- Insert desiccant head and retaining ring back into the sample chamber pushing down squarely and firmly to push past the resistance of the O-ring at the top of the sample chamber.
- Push the desiccant chamber back into the sample chamber.
- Align the countersunk holes in the retaining ring to the holes in the housing and sample chamber within.
- Reattach and tighten the four countersunk screws using the posidrive screwdriver.
- Reattach the handle using the four cap head M4 screws and the hex drive.

13.0 Temperature

Typical ambient variations experienced throughout the world are quite acceptable but avoid placing the instrument in direct sunlight or near a source of radiant or convected heat. In countries that experience extremes of temperature, always carry out the automatic calibration with the instrument at its operating temperature.

14.0 Response Time

The response time of any water vapour pressure detector will naturally be very much quicker from dry to wet, than from wet to dry. This is the reason that the Shaw SDHmini-Ex is so successful. The sensor is kept in a dry condition when it is not in use and therefore results are obtained in the quickest possible time.

To check whether a particular instrument is within specification, carry out the automatic calibration procedure, close the instrument head and note the reading ten minutes later. If the unit has not dried down to -40 °C after this ten minute period, the instrument should be returned to your supplier/authorised distributor for examination.

15.0 Guarantee

All Shaw products are guaranteed for two years from the date of purchase, some exclusions are as follows:

Removing protective guard from any sensor, subjecting sensor to shock or black list gases e.g. caustic and acidic gases like ammonia and chlorine, tampering with any internal electronics and applying incorrect supply to voltage meters, subjecting to excessive flow rate, contaminants and general misuse.

If you suspect a fault which you feel needs to be attended to under guarantee please contact us for assistance hopefully to help fault find and effect a remedy and if this is not successful, to give precise instructions for the return for inspection.

No equipment will be replaced or repaired without having been returned for inspection either to ourselves or an authorised distributor.

16.0 Basic Definitions

Water Vapour Pressure
The pressure exerted by the water vapour contained in any mixture of gases. The total pressure exerted by the gas mixture is the sum of the pressures exerted by its components – including the water vapour. Water Vapour Pressure varies in direct proportion to the total gas.

Dewpoint Temperature
The temperature to which the gas must be cooled in order that it should be saturated with water vapour (i.e. 100% relative humidity). For practical reasons it is referred to water above 0 °C and ice below 0 °C.

Parts Per Million by Volume
PPM(v) or VPM is the ratio of the water vapour pressure to the total gas pressure.

Parts Per Million by Weight - PPM(w) is the same as VPM, except that the figure is modified according to the ratio of the molecular weight of water vapour to the molecular weight of the carrier gas mixture.

Relative Humidity - The ratio of the actual water vapour pressure in the gas to the saturation water vapour pressure at the same temperature.

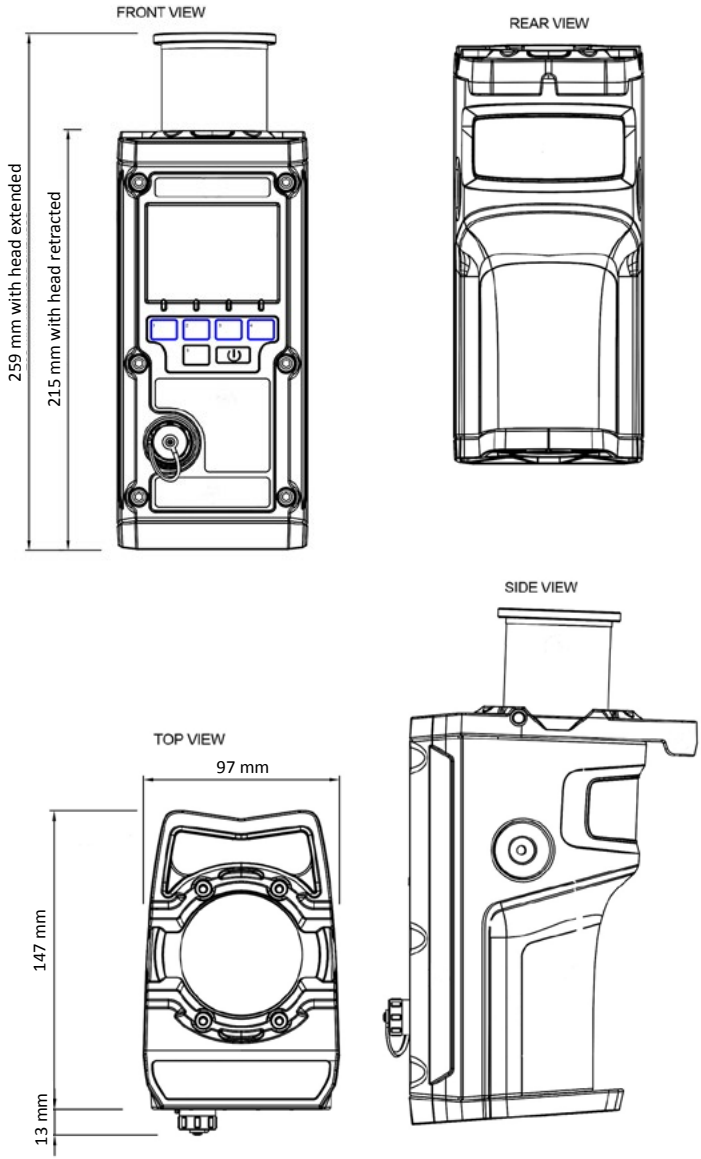
17.0 Problem Guide

Fault	Explanation	Required Action	Notes
Unit does not turn on. Screen remains blank and back light off.	Battery low level.	Connect a battery charger unit for a minimum of 12 hours charging.	
Logging menu does not work.	Not a logging version.	Upgrade unit to logging version if required.	
Unit needs AutoCal.	Perform AutoCal. AutoCal failure.	Sensor sensitivity too low. Repeat AutoCal.	If AutoCal fails, contact supplier to replace sensor.
Unit always reads lower limit.	Sensor cable broken.	Repair cable.	
Unit will not dry down to lower limit.	Sieve wet.	Perform service on unit using Service Kit.	Service Kit available from supplier.
'O' ring failure.		Perform service on unit using Service Kit.	Service Kit available from supplier.
Battery has short life between charges.	Battery reaching end of life.	Return to supplier/ authorised distributor for battery replacement/ exchange.	Order from supplier
Keypad damaged	Check function of keypad electrically.	Contact supplier.	

18.0 SDHmini-Ex Specifications

Accuracy:	±2 °C
Type:	Battery powered hygrometer complete with carrying case. For use with desiccant chamber for rapid readings. Certified intrinsically safe for operation in hazardous areas. ATEX: Intrinsically safe to ia IIC T4 Ga & Ex ia IIIB T60°C T_{50}80°C Da UL/CSA: Class I Div 1 Groups A, B, C and D T4 FCC ID:QOQWT41 IC:2153A-BGTWT41 EMC Directive 89/336/EEC as amended by Directives 92/31/EEC and 93/68/EEC within CE marking requirement WT41-E has modular certification with certification number R 209-J00047
Dimensions:	97 mm (w) x 211 mm (h (259 mm head extended)) x 147 mm (d)
Weight:	1.75 kg (3.8 lbs)
Display:	Full colour graphics LCD. 320 x 240 resolution. Three main viewing - digital, graphical and a traditional moving coil. Secondary display in the top right for display of readings in alternative units of measurement.
Sensor Connection:	Internal
Power Supply:	Single lithium-ion cell (4.2 V peak, 3.8 V nominal). Use only batteries supplied with instrument.
Sampling:	Pressure: Atmospheric with flow rate of 2 - 5 litres/minute.
Operating Temperature:	-20 °C to +50 °C
Storage Temperature:	-30 °C to +70 °C
Operating Humidity:	95% RH non-condensing
Calibration:	AutoCal on all (but Blue range)
Accessories/Options:	Bluetooth printer
Sensor Type (r): Purple (P): Red (R): Grey (G): Blue (BL): Silver (S):	Sensor Range -100 °C dewpoint to 0 °C dewpoint -80 °C dewpoint to -20 °C dewpoint -80 °C dewpoint to 0 °C dewpoint -80 °C dewpoint to +20 °C dewpoint -100 °C dewpoint to -20 °C dewpoint
Sensor:	Operating Principle: Shaw Ultra High Capacitance Aluminium Oxides Sensor

19.0 SDHmini-Ex General Assembly Diagram



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