Model DSP-Ex

Portable Dewpoint Meter

Instruction Manual

Alpha Moisture Systems
Alpha House
96 City Road
Bradford
BD8 8ES
England

Tel: **+44 1274 733100**
Fax: **+44 1274 733200**
Email: **info@amsytems.co.uk**
Web: **www.amsystems.co.uk**

Model DSP-Ex Automatic Dewpoint Meter

Index

1. General Description 1
2. Instrument Configuration 1
   2.1 Adjusting Variables 2
   2.2 Selecting Engineering Units 3
3. Normal Operation 5
4. Factory Calibration 7
5. Batteries 7
6. Transit Case 7
7. Hazardous Area Certification 8

1. General Description

The Model DSP-Ex Automatic Dewpoint Meter is a fully self-contained portable instrument, specifically designed to measure the moisture content of air or gas on a spot-check basis.

The instrument is operated with its own internal batteries and requires no external power source.

The read-out of moisture content is on a dot-matrix LCD, in any one of several selectable engineering units.

The unique measuring head is designed to keep the sensor dry when the instrument is not in use, making spot checks a simple and speedy process with minimum air or gas usage.

Model DSP-Ex utilises Alpha Moisture Systems advanced dewSmart sensor which allows complete interchangeability of sensors and ranges.

The calibrated measuring range is stored within the sensor and is readable from the analyser display (see page 2, item 2).

Details of normal operation, engineering unit selection, sensor data and configuration of the instrument are described within this manual.

2. Instrument Configuration

The standard factory settings are such that the instrument will display the moisture content in °C Dewpoint has the auto switch-off facility activated and the display contrast set at a mid-point.

The other facilities and information available from the sensor and instrument are determined by the range of sensor in use, it's calibration data and the hardware of the instrument itself.

To access the available information and change variables use the following procedure:-

Switch the instrument on by pressing the **I/0** key once.

The display will read the word **INITIALISING**. This is the normal start-up routine during which the functions of the instrument and integrity of the sensor calibration data are verified.

The display will then read **INSTRUMENT OK**. This confirms that all instrument functions are working normally.

The display will then read **CALIBRATION DATA OK**. This confirms that normal communications with the sensor have been established and that the integrity of the calibration data, held within the sensor, has been verified.

The display will then read the moisture content of the air surrounding the sensor in °C Dewpoint, (or the equivalent in other engineering units if so selected).

2.1 Adjusting Variables

To read Sensor and Instrument information, change the display contrast and enable/disable the automatic shut-down facility:-

a) Press the keys marked  and  together and hold pressed for approximately 4 seconds.

The display will read **SENSOR INFORMATION.**

b) Press the key marked  once.

The display will show the sensor (probe) serial number.

c) Press the key marked  once more.

The display will show the calibrated range of the sensor installed.

d) Press the key marked  once more.

The display will show the calibration date of the sensor installed.

e) Press the key marked  once more.

The display will show the suggested date of recalibration of the sensor installed. Normally 12 months after the calibration date.

f) Press the key marked  once.

The display will show the instrument type and software version

g) Press the key marked  once more.

The display will show **LCD CONTRAST- LIGHTER DARKER**

At this point the contrast can be adjusted to the desired level by pressing either the key marked  to lighten the display or  to darken the display.

NOTE: The contrast is incremented by the keys and does not scroll by holding the keys pressed.

When the contrast level is satisfactory, move to step h.

h) Press the key marked  once more.

The display will show **AUTO SHUT DOWN** together with the status of this facility, either **ON** or **OFF**.

To put this facility **ON** (enable) press 
To turn it **OFF** (disable) press 

NOTE: When the AUTO SHUT DOWN is ON, the instrument will automatically switch OFF if no keys are pressed within a period of 5 minutes.

i) When the variables have been set to the desired positions press the key marked  .

This fixes the settings within the instrument and on each subsequent start-up these levels will be maintained.

The display will now be shown °C Dewpoint (or equivalent).

2.2 Selecting Engineering Units

To change the displayed engineering units from ºC Dewpoint to either ºF Dewpoint, PPM(V), PPB(V), g/m3, lb/MMSCF or PPM(W), use the following procedure:-

a) Press the key marked  and hold pressed for approximately 4 seconds.

The display will show the letters SU (select units) in the top right hand corner.

b) Subsequent presses of the key marked  will scroll the display through the options of engineering units available.

The order in which the engineering units will appear on the display and their definitions is as follows:-

°C DEWPOINT: The temperature at which Condensation or Frost forms if the gas is cooled, expressed in degrees centigrade.

It is important to note that the term DEWPOINT is comonly used to include frost point and all readings below 0ºC are in fact measurements in equilibrium over ice.

°F DEWPOINT: As above but expressed in degrees Fahrenheit.

PPM(V):	The volume of water vapour per total volume of gas expressed as parts of water vapour per million parts of gas.
PPB(V):	As ppm(V) but expressed in parts of water vapour per billion parts of gas. This unit is only used in cases where the moisture content of the gas is less than 1ppm(V) (1000 ppb(V)). At levels above 1000 ppb(V) the instrument display will show OUT OF RANGE if switched to the PPB(V) section.
g/m3:	Mass of water per unit volume of gas expressed as grams of water per standard cubic meter of gas.
lb/MMSCF:	As g/m3 but expressed as pounds of water per million standard cubic feet of gas.
PPM(W):	Similar to PPM(V) but with reference to mass (weight) rather than volume. In this case the ratio of weights change with the molecular weight of the carrier gas.

When the required units of measurement are displayed, press  to enter this information into the instrument. The instrument will then display the moisture content in the selected engineering units on each subsequent start-up

If the (enter) key is pressed to select PPM(W) units, the option is then available to select one of several common gases or a variable setting where the molecular weight of any other gas can be entered. This option is denoted by the letters SG (Select Gas) which will be seen in the top right hand corner of the display.

The common gas types installed are AIR, ARGON, NITROGEN, CO2, SF6 & H2. Scrolling through these options is achieved by pressing the key marked  .

Following the end of the list shown above, the screen will display PPM(W) Mol Wt: X; where X is any number between 0 and 99.

If PPM(W) is the required unit of measurement and the gas to be measured does not appear on the installed list, then the molecular weight of this gas should be installed by pressing the key marked  which indexes the number (mol weight) between 0 and 99 (1 press = 1 digit).If the key () is pressed at 99 then the number reverts to 0.

When the required gas or molecular weight has been selected, press the key marked  , at this point the letters SG will disappear. This installs the selected units into the instrument programme and the instrument will start-up in these units at every subsequent 'start-up'.

NOTE. If when the (enter) key is pressed to select units in PPM(W), the display already shows the correct gas, simply press again to confirm this setting.

Other units can be installed by reselecting and storing, using the above procedure.

3. Normal Operation

In order to take moisture content readings of air or gas, having pre-selected the required units of measurement, use the following procedure:-

1) Locate the instrument in a convenient position, as close as is practical to the sample point and move the handle from its carrying position to allow clear operation of the telescopic measuring head.

   NOTE. The position of the handle is adjustable, in 300 steps, by pressing the two black buttons, one at each pivot point, and manually positioning the handle. Releasing the buttons allows the handle to lock into the required position.

   It is not important which position the instrument is placed in, as it will operate in any attitude.

2) Switch the instrument ON by pressing the key marked I/0.

   NOTE. When the instrument is switched ON, the instrument will go through its initialising routine and data verification procedures described above. This routine takes approximately 10 seconds, after which time the instrument will display the moisture content of the air or gas surrounding the sensor, in whatever engineering units have been selected. This will happens every time the instrument is switched ON.

3) The sample tube supplied is fitted with a Female Swagelok quick connect coupling, at one end, for connection to the male connector positioned below and to the left of the measuring head. To make this connection, simply push the two halves of the connector together and allow the locking ring to locate. To disconnect this coupling push the locking ring towards the instrument panel and the two halves will spring apart.

   The other end of the sample tube is supplied with a 1/8" NPT male connector which should be adapted to fit the sample point connector.

   NOTE. It is important to note, at this time, that the material used for the sample tube is critical, especially when measuring very low moisture levels. The ideal material is stainless steel but this is normally impractical for a portable instrument. Where flexible tube is to be used, the preferred material is PTFE (Teflon). This offers a reasonable degree of flexibility and has good resistance to external moisture ingress. The sample tube supplied with the instrument is ideally suited to this purpose.

4) Open the sample valve, at the sample point, to allow a small flow of air or gas through the system, at atmospheric pressure. The actual flow is unimportant, as the measuring sensor is not flow sensitive, but it is suggested that a flow of between 5 and 10 L/min is an ideal compromise between minimum gas usage and system response speed.

5) Allow the instrument and pipework to purge and then restrict the sample exhaust, from the instrument, with a finger. This will cause the telescopic section of the measuring head to extend from the front panel of the instrument under the pressure of air or gas. If there is insufficient gas pressure to extend the head, grip the outer knurled section of the head and, while twisting clockwise, gently extend the head by pulling it out from the front panel, while keeping the sample exhaust blocked.. When the head is fully extended, remove the finger from the sample exhaust and allow the sample to flowthrough the measuring head.

6) The display will indicate the change in moisture content surrounding the sensor. Observe the display and when there is no further change in reading, the displayed value is the gas moisture content.

NOTE. If there is any uncertainty as to whether equilibrium has been achieved in the system (pipework and measuring head), which is necessary to reach an accurate measurement, a simple test can be carried out as follows:-

a) After the display has stopped moving, increase the sample flow, slightly.
b) Observe the display.
i) If the displayed value remains constant the reading is accurate.
ii) If the displayed value begins to fall, the system was insufficiently purged and water vapour is still outgassing from the internal surfaces of the sample pipe work or measuring head OR there is a leak at the sample valve or one of the connections.

It is very important to note that if there is a leak in any part of the system, water vapour will defuse, from the ambient air, into the sample, even though the gas is flowing out of the faulty connection.

7) When the measurement is complete,

a) Close the measuring head by manually pushing the extended section back towards the panel front and switch the instrument OFF.

NOTE. Ensure that the measuring head is fully closed. Failure to do so will cause the internal desiccant to become wet and impair the efficiency of operation of the instrument.

b) Remove the sample by closing the valve at the tapping point,

c) Disconnect the sample tube from the instrument and sample point.

This completes the procedure and the instrument can be removed to the next test point or stored until required again.

NOTE. If the reading taken from the instrument is in 0C or 0F dewpoint, it is important to remember that this value is at 1 bar A pressure. If the dewpoint is required at any other pressure, the dewpoint calculator, supplied with the instrument, should be used to calculate that dewpoint. Instructions for use are printed on the calculator face.

4. Factory Calibration

Comparing the readings given from the instrument with those obtained from a standard, traceable dewpoint analyser performs factory calibration. The traceability is to the British Standard Moisture Generator held at the National Physical Laboratory, London. These comparative results are detailed in the Certificate of Test and Calibration supplied with the instrument.

5. Batteries

The Model DSP-Ex is powered by 6 x C size batteries.

The typical battery life is in excess of 250 hrs. continuous operation.

The analyser will display, in the top left hand corner of the screen, the letters **LB (LOW BATTERY)** when the batteries are to be changed.

At the point when the **LB** sign is displayed there is approximately 2 hrs. battery life left before the sign changes to **VLB (VERY LOW BATTERY).**

At the point when the VLB sign is displayed the batteries will only power the instrument for a further 30 minutes, at which time the instrument will shut-down totally, and will not be operational until new batteries are installed.

If the instrument is switched ON after the very low battery automatic shut-down has taken place it will automatically switch itself OFF again.

Access to the batteries, for replacement purposes, is gained by firstly removing the cover plate, on the back panel of the instrument, using the Allen Key provided and then unscrewing the covers from both of the battery holders.

Fit new batteries as shown on label adjacent to the battery holders, replace the covers and refit the cover plate.

6. Transit Case

(If Supplied)

The transit case is designed specifically to protect the instrument during transportation and storage.

Access to the analyser, within the case, is achieved by lifting the two catches towards the carrying handle and moving the latch bars away from the upper section of the locks.

The instrument can be operated either while still installed in the transit case, if the handle is positioned to allow full movement of the sample chamber, or removed from the case for ease of positioning near to the sample point.

The sample tube, dewpoint calculator and Allen key to remove the battery carrier cover plate, are housed in the hinged section inside the lid of the transit case.

The case carrying shoulder strap and keys to lock the case are also housed in the hinged section inside the lid.

Access to this storage compartment is achieved by pulling the small leather strap, positioned near the outer edge of the hinged cover, to release the two spring catches, which secure it.

Ensure that both catches are secure when closing the cover of the compartment to guarantee secure storage of the items held within.

7. Hazardous Area Certification

See next page

sira
Certification Service

1 **EC TYPE-EXAMINATION CERTIFICATE**

2 Equipment intended for use in Potentially Explosive Atmospheres Directive 94/9/EC

3 Certificate Number: Sira 02ATEX2132X

Equipment: Model DSP-Ex Automatic Dewpoint Meter

5 Applicant: Alpha Moisture Systems

6 Address: Alpha House
96 City Road
Bradford
BD8 8ES
England

7 This equipment and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

8 Sira Certification Service, notified body number 0518 in accordance with Article 9 of Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment intended for use in potentially explosive atmospheres given in Annex II to the Directive.

The examination and test results are recorded in confidential report number R52A9102B.

9 Compliance with the Essential Health and Safety Requirements, with the exception of those listed in the schedule to this certificate, has been assured by compliance with the following documents:

EN 50014:1997 including amendments A1 and A2
EN 50020:2002
EN 50284:1998

10 If the sign 'X' is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.

11 This EC type-examination certificate relates only to the design and construction of the specified equipment. If applicable, further requirements of this Directive apply to the manufacture and supply of this equipment.

12 The marking of the equipment shall include the following:

II 1G
EEx ia IIC T4 (T_a = -20°C to +37°C)
EEx ia IIC T3 (T_a = -20°C to +50°C)

Project Number: 52V10767
Date: 6 November 2002
Re-issued: 15 September 2003
C. Index: 13

C Ellaby
Certification Officer

Sira Certification Service
Rake Lane, Eccleston, Chester, CH4 9JN, England
Tel: +44 (0) 1244 670900 Fax: +44 (0) 1244 681330
Email: exhazard@siratc.co.uk
Sira Certification Service is a service of Sira Test & Certification Ltd

SCHEDULE

EC TYPE-EXAMINATION CERTIFICATE

Sira 02ATEX2132X

Re-issued 15 September 2003 to allow report number R52A9102B to replace report number R52A9102A

13 **DESCRIPTION OF EQUIPMENT**

The Model DSP-Ex Automatic Dewpoint Meter is a portable hygrometer. The meter indicates the moisture content of gases and displays the results in various units on a liquid crystal display. The apparatus is supplied from six Duracell C-size cells contained in two battery carriers, each having two current-limiting resistors potted into one end. There are no other sources of supply and no connections to external devices. The apparatus is housed in a steel enclosure with a plastic window to allow reading of the LCD. The enclosure also houses a certified DewSmart Sensor.

14 **DESCRIPTIVE DOCUMENTS**

14.1

Drawing No.	Sheets	Issue	Rev.	Date	Title
821	1 to 2	3	1	23 Jul 98	Schematic
822	1 of 1	4	2	11 Aug 98	Parts list
823	1, 2, 3 of 6	3	3	11 Aug 98	Artwork
832	1 of 1	1	1	22 Jul 98	Cable assembly
834	1 of 1	2	-	22 Oct 02	Battery carrier
843	1 of 1	1	2	04 Aug 98	General arrangement
846	1 to 2	1	2	04 Aug 98	GA parts list
1195	1 of 1	1	-	01 Jul 03	Labels

14.2 Report No. R52A9102B

15 **SPECIAL CONDITIONS FOR SAFE USE** (denoted by X after the certificate number)

15.1 Under certain extreme circumstances, external non-metallic parts of this equipment may generate an ignition-capable level of electrostatic charge. Therefore, when it is used for applications that specifically require group II, category 1 equipment, the equipment shall not be located where the external conditions are conducive to the build-up of electrostatic charge on such surfaces. Additionally, the non-metallic parts of the equipment shall only be cleaned with a damp cloth.

16 **ESSENTIAL HEALTH AND SAFETY REQUIREMENTS OF ANNEX II** (EHSRs)

The relevant EHSRs that are not addressed by the standards listed in this certificate have been identified and individually assessed in Report No. R52A9102B.

17 **CONDITIONS OF CERTIFICATION**

17.1 The use of this certificate is subject to the Regulations Applicable to Holders of SCS Certificates.

17.2 Holders of EC type-examination certificates are required to comply with the production control requirements defined in Article 8 of directive 94/9/EC.

17.3 This certificate relies on the following previously-certified product. When used as part of the equipment, the key attributes listed in the table below shall still be maintained by their original certificate.

Product	Certificate number	Key attributes
dewSMART Digital Dewpoint Sensor	Sira 02ATEX2131X	EEx ia IIC T5 (T_a = -20°C to +60°C) U_i 11 V, I_i 0.1 A, P_i 0.283 W, C_i 1.66 μF, L_i 0

Date: 6 November 2002
Re-issued: 15 September 2003

Sira Certification Service
Rake Lane, Eccleston, Chester, CH4 9JN, England
Tel: +44 (0) 1244 670900 Fax: +44 (0) 1244 681330
Email: exhazard@siratc.co.uk
Sira Certification Service is a service of Sira Test & Certification Ltd