CERMAX I.S.

PORTABLE DEWPOINTMETER

INSTALLATION, OPERATION AND MAINTENANCE MANUAL

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KAHN INSTRUMENTS, INC.

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1. INTRODUCTION

CERMAX I.S. is an advanced portable instrument for the measurement of absolute moisture content of air or gases. It is designed to fulfill a wide range of applications by direct read out of moisture content displayed on the LCD display. The instrument offers several customer selectable display options based on a calibrated dewpoint measurement range of -100 to +20°C. The instrument provides indication only from -100 to -120°C as well as from +20°C to +30°C dewpoint.

As a portable, the CERMAX I.S. instrument has been designed specifically for spot check measurement applications requiring an optimum combination of performance in terms of speed of response and accuracy. Making such a measurement with CERMAX I.S. is extremely simple. Connect a sample flow of the gas to be measured, press the 'ON' button, select the desired operating mode and read the measurement.

CERMAX I.S. is approved as an Intrinsically Safe device for use in Hazardous Locations.

Canadian Standards Association (CSA)

CERMAX I.S. has been assessed against the Standards CSA 22.2 No.157-M1992 & CAN/CSA E-79 No.11 and carries the following marking code:
Intrinsically Safe CL1, Div 1, Gp A,B,C&D T3C.

Factory Mutual Research Corporation (FM)

CERMAX I.S. has been assessed against the Approval Standard FM3610 (October 1988) and carries the following marking code:
Intrinsically Safe CL1, Div 1, Gp A,B,C&D T3C.

ATEX Conformity & Product Certification (Optional)

Please note, ATEX conformity is an optional certification which must be requested at the time of order. Please contact Kahn Instruments for more information.

CERMAX I.S. may be provided optionally as certified compliant to the **ATEX Directive (94/9/EC)** Intrinsically Safe for use in hazardous areas and has been assessed so by **Baseefa (2001) Ltd** (Notified body 1180). The instrument conforms to the **C.E.N.E.L.E.C.** standards specified in **BS EN 50 014** and **BS EN 50 020**, and attributed with the product certification code

Ex **II 1 G EEx ia IIC 155°C(T3)**, certification number **Baseefa03ATEX0090X.**

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Before using CERMAX I.S. in any hazardous environment, ensure you are fully familiar with the **ATEX Directive (94/9/EC)** and the above standards relating to the certification of this instrument and also with the further information to be found in the ATEX worker protection Directive (1999/92/EC), concerning the minimum requirements for improving the safety and health protection of workers potentially at risk from exposure to explosive atmospheres.

This instrument has been designed to withstand impacts and shocks during normal operating conditions. No additional protection is required when operating the instrument. If this instrument is subjected to an abnormal impact (i.e. accidental dropping) the instrument should not be operated within a Hazardous Area until a thorough inspection has been conducted and any faults rectified. The instrument should only be stored and used within the specified temperature ranges.

In the unlikely event that an instrument failure occurs the instrument must only be returned to Kahn Instruments for repair. NO attempt must be made, by any other party other than the manufacturer, to rectify or repair this product. To do so will invalidate the product Certification.

This instrument is not intended to be exposed to dust conditions.

If this product is installed and used as per the directions described within this manual, this product will not be subjected to mechanical stress.

This product has been designed so that it will not give rise to physical injury or other harm due to contact. This product will not produce excessive surface temperature, infra-red, electromagnetic, ionizing radiation and does not possess non-electrical dangers.

This product should not be installed where it may be subjected to mechanical and thermal stresses or where it may be attacked by existing or foreseeable aggressive substances.

Possible operating Faults	**Actions**
Battery discharged	Battery charging is not permissible within a hazardous area. Use the supplied charger only, within a non-hazardous area. The use of a battery pack other than that designed and supplied for the Cermax I.S. will invalidate the products certification.

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Logging memory full or incorrect instrument setup.	The downloading of the logging memory and the setup of the instrument, which involves communication with the Cermax I.S. via a P.C. serial port, is only permissible within a non-hazardous area. **The Serial Link Cable is not certified for use within the hazardous area.**
Sensor over/under range or inaccurate sensor measurement	To ensure the sample is: i) Representative of the gas under test ii) Subject to a minimise volume of gas iii) Absent of particulate matter Refer to section 4 on the mechanical installation. **Replacement of the sensor to rectify a measurement fault or for an annual recalibration, must be performed within a non-hazardous area**.

WARNING: SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY.

1.1 Calibration

Calibration is performed using precision dewpoint generators and transfer standard optical hygrometers which have been calibrated directly at the National Institute of Standards and Technology (**NIST**).

As with all precision measurement equipment, calibration integrity depends on regular verification. Kahn Instruments suggest that the instrument be returned to the Kahn Calibration Laboratory at least once a year for a re-calibration. Calibration is inexpensive and ensures continued accurate operation of the instrument.

1.2 Manufacturing Quality

Your hygrometer should reach you in perfect working condition. Rigorous procedures at every stage of production ensure that the materials of construction, manufacturing, calibration and final test procedures meet the requirements laid down by our Quality System.

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2. OPERATION

2.1 General

Operation of the CERMAX I.S. is very simple as long as necessary precautions are taken to protect the sensor from damage. Statistical information indicates that the vast majority of failures are caused either by incorrect sampling methods, or inadequate protection against harmful substances.

2.2 Basic Operation

A brief summary of the operating procedure of the CERMAX I.S. is shown on the instruction label which is attached to the inside of the instrument case flap. This instruction label is designed to remind the user, through the use of simple graphical representations, of the key methods of connecting to the instrument for gas sampling, communication, remote process variable input and battery charging. Each aspect is explained in a step-by-step sequence identifying the stages required to achieve the quickest route to the desired outcome. The flap label has two sections, each presented as a horizontal row. The first row, at the top of the label, identifies the steps needed to connect the instrument to the gas under test, perform a measurement and access the instrument configuration menus. The bottom row shows the location of the communications port, the external charging socket and the battery pack.

2.2.1 Connecting to a Sample gas

Care should be taken to ensure that the gas connected to the CERMAX I.S. instrument, and any tubing used to make the connection, contains NO LIQUIDS in droplet form and NO PARTICULATE matter.

Refer to section 4.2 of this manual for further information and sampling hints.

The gas connections to the CERMAX I.S. are made by way of the two Swagelok type stainless steel bulkhead fittings that take 1/8" OD sample pipe. The bulkheads are identified as inlet and outlet by the symbols molded into the case. Care should be taken to follow the polarity of connection suggested. Gas under test should be restricted to flow rates between 0.5 and 5 normal liters per minute and pressures from atmospheric to 6000 PSIG. When connecting the sample tubing, ensure that the components are finger-tight and then tightened a further 90° using a suitable wrench. Care should be taken not to over-tighten the bulkhead fittings as this may result in damage to the instrument.

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2.2.2 Making a Measurement

After connecting the sample gas, the instrument should be switched on using the on/off switch located on the control panel. Select the required user setup mode either **Default** to use standard configuration settings, or **Previous** to re-use custom settings from the last measurement cycle.

After selecting the desired setup mode, a reading of the sample gas will be displayed. Changes to the display configuration can now be made. Details of the display options, and their methods of selection, can be found in section 3. Configuration.

2.3 Modes of Operation

The CERMAX I.S. instrument has two basic modes of operation, **Field Mode** and **Laboratory Mode**. For details on the method of selection for **Field Mode** and **Lab Mode**, see sections 3.7 Serial Communications and 3.7.1 Using Terminal Commands.

When the display is showing the measured value, pressing the "0" button will toggle the FIELD MODE or LAB MODE setting (depending upon its previous setting). When the "0" button is pressed, the new mode setting will be shown in the bottom left corner of the display.

Field Mode is the default setting for normal use. In this configuration, the instrument response is optimized to the primary requirements of users of portable dewpoint hygrometers and will provide the operator with accurate dewpoint determinations in the quickest time possible. In this mode of operation, readings are typically obtained to within 2°C dewpoint (or equivalent) of final value within 15 minutes from connecting the gas sample line to the instrument and switching it on. As a general rule, measurements of less than 2 hours continuous duration should be made in **Field Mode**. It is not generally recommended that measurements where the expected final reading is below -80°C dp, or equivalent, be made in **Field Mode** as determinations of such trace moisture levels require extended periods to reach equilibrium and are more suited to **Lab Mode**.

Lab Mode is provided for the user who wishes to make extended measurements that make full use of the CERMAX I.S. instrument's combination of high accuracy and low dewpoint measurement capability. In **Lab Mode**, the instrument is configured to provide the ultimate in terms of accuracy but at the expense of longer stabilization times. This mode of operation is best suited to either measurements made under exacting laboratory conditions or where the instrument is to be left attached to the same gas stream for extended periods of operation. Measurements of longer than two hours should be made in **Lab Mode**.

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For clarity, the selected mode of operation is displayed continually to the user via the instrument display. The selected mode of operation is also included in the header attached to logged data files.

2.4 Location of Inputs and Outputs

The CERMAX I.S. instrument is a powerful measurement tool which can perform many advanced functions. In order to make full use of these functions, it is first necessary to know where the inputs and outputs are located and their purposes.

2.4.1 Battery Pack

The CERMAX I.S. battery pack is located on the opposite side of the case to the display, as is shown graphically on the case flap label. The battery pack is held in place by four fasteners and can be removed either for charging or to be exchanged for a spare battery pack. Battery packs may be exchanged in a Hazardous Area. **The battery charger supplied with CERMAX I.S. is not suitable for charging batteries in a Hazardous Location and charging must be performed in a Non Hazardous Location. The use of battery packs other than those designed for and supplied with the CERMAX I.S. instrument will invalidate product Certification.** The connector for charging the battery pack is clearly identified by a label on the battery pack itself.

Spare battery packs are available for the CERMAX I.S. Use only battery packs and charger systems supplied for use with the CERMAX I.S. Use of any other chargers or batteries will result in permanent damage to the instrument.

Note: Do not connect the battery charger to any other ports on the instrument.

2.4.2 Digital Communication Port

The CERMAX I.S. instrument is provided with an RS232 communications port. This is to allow the operator to access some of the instrument configuration parameters that are not accessible via the keypad and also to download logged data files (see sections 3.6 Logging Menu and 3.7 Serial Communication for more information). The communications port is located behind the panel to the side of the sample gas bulkheads. To provide connection to a terminal an Opto Serial Link Cable is supplied with the instrument. This cable has a 3 way Opto link connector to mate with the CERMAX I.S. instrument and a standard 9 way D socket connector for connection to the chosen terminal device.

The Serial Link Cable is not Certified for use within Hazardous Locations.

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3. CONFIGURATION

3.1 User Setup

On power-up, the user will see the opening screen displayed for approximately 10 seconds. This contains the instrument's Sensor Serial No., and its calibration date. The screen will then display the **USER SETUP** screen. On this screen the user must select either the **DEFAULT** setup or the **PREVIOUS** setup options. Selecting the **DEFAULT** setup will cause previously selected options to be lost and the following default configuration to be set:

Dewpoint, **Over Ice**	Main display option
None	Auxiliary option.
°F (Fahrenheit)	Temperature units if US format has been selected, or
°C (Celsius)	Temperature units if UK format has been selected (*See section 3.7 Serial Communication).*
PSIG	Pressure units. Dewpoint is displayed for a sensor at atmospheric pressure.

The user may subsequently change the options via the setup menus. To toggle between the User Setup: **DEFAULT/PREVIOUS** options, press the ➔ key.

To select an option, press the **SELECT** key and the screen will change to the Main Display.

```
CERMAX I.S.
SENSOR ID C123 C45 CALIBRATED 14:04:97
SOFTWARE VERSION B1.80.00 IS
KAHN INSTRUMENTS, INC.
```

Figure 1. Opening Screen

```
USER SETUP: DEFAULT✓ PREVIOUS


                    BATTERY CHECK OK
```

Figure 2. Setup Selection

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3.2 Main Screen

The main screen includes both the **MAIN DISPLAY**, as defined by the main display menu options, and the **AUXILIARY DISPLAY**, as defined by the auxiliary display menu options.

The selected operating mode is shown in the bottom center of the screen. The bottom right of the screen displays the month and year when the sensor is next due for calibration. This message will be replaced by a warning if the battery power falls below the optimum value.

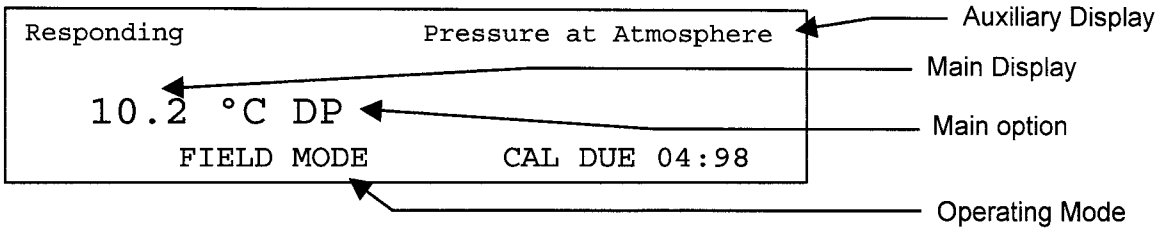

Figure 3. Main Screen

```
Stable                    Pressure at Atmosphere

    10.2 °C DP
                    WARNING - LOW BATTERY
```

Figure 4. Main Screen, with Low Power Indication

To toggle between the Main Screen and the Logged Data screen, press the **DISPLAY** key. If no logged data is currently held in the logging memory, the Logging Display will show the current date and time. If incorrect, change the date and/or time using the terminal commands (*see section 3.7 Serial Communication)*

```
DATE 04:14:97
TIME 14:25
NO LOGGED DATA AVAILABLE
```

Figure 5. Logged Data Screen

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3.3 Setup Menus

Three menus are available:

- The **MAIN DISPLAY** Menu is for selecting the units of moisture measurement.
- The **AUXILIARY DISPLAY** Menu is for configuring the temperature and pressure variables.
- The **LOGGING** Menu is for configuring the data logging facility.

It is not a requirement that all menus be configured before use, since CERMAX I.S. is supplied with a default setup.

3.3.1 Moving Around the Menus

The current cursor position is indicated by a flashing shaded box.
Any current selection is indicated by a check mark ✓.
To enter the Menus, press the **SETUP** key.
To scroll vertically through the menu, press the ↓ key.
To scroll horizontally through the menu, press the → key.
To select an option, press the **SELECT** key. The selected option is indicated by a check mark.
To select a different menu, press the **SETUP** key.
To return to the Main Display, press the **DISPLAY** key.

Note: Menu options can not be changed if logging is either in progress or set to delayed start.

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3.4 Main Display Menu

The Main Display Menu allows the user to select the type of moisture measurement unit for the Main Display. These are:

DP	Measures Dewpoint. The measurement can be displayed either as **Over Water** or **Over Ice**. This is also known as Dewpoint and Frost point respectively and can be in units of °C, °F, or K.
PPM(V)	Measures Parts Per Million of water to dry gas, expressed by volume.
PPM(W)	Measures Parts Per Million of water to dry gas, expressed by weight. You may select between Nitrogen, Air, Carbon Dioxide and Hydrogen.
g/m^3	Measures water content in grams per cubic meter of Natural Gas.
lb/mmscf	Measures pounds of water vapor per Million Standard Cubic Feet in Natural Gas.
%RH	Measures the Percentage Relative Humidity

Note: On all Menus only 3 options will be displayed at any one time, pressing the ↓ Key will scroll further options up the screen.

3.4.1 Selecting Measurement Required

Move the cursor to the required option by pressing the ↓ key. The available sub-menu options will appear as one scrolls down the screen.

```
MAIN DISPLAY    AUX DISPLAY     LOGGING
 DP       °C✓  °F K OVER WATER
 PPM(V)
 PPM(W)
```

Figure 6. Main Menu (upper portion)

```
MAIN DISPLAY    AUX DISPLAY     LOGGING
 g/m³
 lb/mmscf
 %RH
```

Figure 7. Main Menu (lower portion)

Select by pressing the **SELECT** key and the selected item will have a ✓ appear next to it.

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```
MAIN DISPLAY     AUX DISPLAY      LOGGING
DP✓      °C✓ °F K OVER WATER
PPM(V)
PPM(W)
```

Figure 8. Example. Selecting Options Identified with ✓

3.4.2 Selecting Dewpoint options (sub menu)

The user may display the Dewpoint in temperature units of Celsius, Fahrenheit or Kelvin. Move to the desired temperature unit by pressing the ➔ key, then press the **SELECT** key.

```
MAIN DISPLAY     AUX DISPLAY      LOGGING
DP✓      °C °F✓ K OVER WATER
PPM(V)
PPM(W)
```

Figure 9. Example. Selecting Dewpoint Measurement Unit °F

The default Dewpoint value displayed is **OVER ICE**, however, when Dewpoints above 0^0C are being measured **OVER WATER** will automatically appear. To display Dewpoint over water, above and below 0°C **OVER WATER** must be selected.

```
MAIN DISPLAY     AUX DISPLAY      LOGGING
DP✓      °C °F✓ K OVER WATER✓
PPM(V)
PPM(W)
```

Figure 10. Selecting Dewpoint Over Water Measurement.

3.4.3 Selecting PPM(W) Options (sub menu)

If PPM(W) is selected, move to the desired gas type by pressing the ➔ key, then press the **SELECT** key.

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```
MAIN DISPLAY     AUX DISPLAY      LOGGING
DP
PPM(V)
PPM(W)✓   N2 AIR✓ CO2 H2 SF6
```

Figure 11. Selecting PPM(W) Unit and Gas Type Air

3.4.4 Selecting PPM(V), lb/mmscf, g/m^3 and %RH

No sub-menus are available for PPM(V), g/m^3, lb/mmscf or %RH

3.5 Auxiliary Menu

The CERMAX I.S. instrument is capable of compensating the measurements it makes for the effects of pressure. An input of temperature also allows the calculation of %RH. These temperature and pressure inputs are termed as "Auxiliary" inputs. If the Auxiliary Pressure input feature is used then either a pressure compensated dewpoint can be displayed on the Main Display and an atmospheric dewpoint displayed on the Auxiliary display OR visa versa. The compensations for temperature and pressure are applied after entry of these process variables has been made using the respective menu and via the keypad.

The Auxiliary Menu allows the user to apply pressure compensation to the main measured value, or a temperature for %RH measurements. The table below shows which auxiliary options may be selected with which Main options:

	Auxiliary Options				
Main Display Option	None	Set Temp	Set Press	Sensor	Display
DP	✓	x	✓	✓	✓
PPM(v)	✓	x	✓	✓	✓
PPM(w)	✓	x	✓	✓	✓
g/m^3	✓	x	✓	x	x
lb/mmscf	✓	x	✓	x	x
%RH	✓	✓	x	x	x

None. (Default setting) If selected, the auxiliary display will show Temperature at 21°C.

Set Temp. Allows the user to enter a temperature value, so that the CERMAX I.S. instrument can calculate a %RH using the measured Dewpoint.

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Set Press. Applies pressure compensation using a manually entered pressure. If **Set Press** is selected a further 2 selectable options will appear, these are:

Sensor. This option will display the Dewpoint at either atmospheric conditions or at the sample line pressure.

Display. This will allow the user to display either the pressure compensated Dewpoint or the manually entered pressure.

```
AUX DISPLAY    LOGGING     MAIN DISPLAY
None✓
Set Temp
Set Press
```

Figure 12. Auxiliary Menu Screen

```
AUX DISPLAY    LOGGING     MAIN DISPLAY
Set Press✓
Sensor
Display
```

Figure 13. Auxiliary Menu Screen (with Set Press selected)

3.5.1 Selecting an Auxiliary Option

Move the cursor to the required option by pressing the ↓ key. The user will see the available sub-menu options.

```
AUX DISPLAY    LOGGING     MAIN DISPLAY
None✓
Set Temp  °C °F K Set
Set Press
```

Figure 14. Selecting an Auxiliary Option

3.5.2 Selecting Set Temp Temperature Unit

Only if **%RH** is selected in the **MAIN MENU** can the **Set Temp** and it's sub menu of measurement units be selected. Once **Set Temp** is selected, move to the desired temperature unit by pressing the → key, then press the **SELECT** key. The cursor will then automatically move to the **Set** field.

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```
AUX DISPLAY    LOGGING     MAIN DISPLAY
None
Set Temp✓  °C °F✓ K Set ?
Set Press
```

Figure 15. Example: Selecting the Set Temp Temperature Unit of °F

3.5.3 Entering a Set Temperature

The flashing cursor at the **Set** field is a prompt to the user to enter the temperature required in whole units. To enter a negative value, press the 0 key twice until a minus sign is displayed and press the **SELECT** key. Enter the temperature required in whole units and with respect to these limits:

Maximum allowable values	Minimum allowable values
+200°C	-100°C
+392°F	-148°F
473K	173K

Press the ➔ or ➓ key to accept the value and leave the field. If the value entered is out of range, you will be prompted to re-enter the value. If you leave the field by pressing the **DISPLAY** or **SETUP** key, the value *will not be accepted.*

```
AUX DISPLAY    LOGGING     MAIN DISPLAY
None
Set Temp✓  °C °F✓ K Set -25
Set Press
```

Figure 16. Example: Entering a Set Temperature of -25 °F

3.5.4 Selecting the Set Press Pressure Unit

The **Set Press** feature can be selected for all Main Menu items except **%RH**.
The user may choose to display pressure in units of:

PSIG (Pounds per Square Inch Gauge).
BARG (Bar Gauge)
KPa (KiloPascals).

*Note: **KPa** is expressed in KiloPascals Absolute.* Pressures lower than atmospheric can only be entered in units of **KPa**.

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If a set pressure is required press the ↓ key to move to the menu option of **Set Press**, then press the **SELECT** key. Move to the desired pressure unit by pressing the → key, then press the **SELECT** key. The cursor will automatically move to the **Set** field.

```
AUX DISPLAY    LOGGING     MAIN DISPLAY
None
Set Temp
Set Press✓ PSIG BARG✓ KPa Set?
```

Figure 17. Example: Selecting the Set Press Pressure Unit of BARG

3.5.5 Entering a Set Pressure Value

The user will see a flashing cursor. Enter the pressure required in whole units with respect to these limits:

Maximum allowable values	Minimum allowable values
5880 PSIG	0 PSIG
400 BARG	0 BARG
40,000 Kpa	50 KPa

Press the → or ↓ key to accept the value and leave the field. If the value entered is out of range, you will be prompted to re-enter the value. If you leave the field by pressing the **DISPLAY** or **SETUP** key, *the value will not be accepted.*

```
AUX DISPLAY    LOGGING     MAIN DISPLAY
None
Set Temp
Set Press✓ PSIG BARG✓ KPa Set 38
```

Figure 18. Example: Entering a Set Pressure Value of 38 BARG

When the unit option of lb/mmscf, or g/m^{3,} has been selected, the Cermax IS can only provide this conversion for fixed Set Pressure values, see the table on the following page. This is due to the fact that the engineering unit lb/mmscf is non-ideal and has been derived empirically. Cermax IS uses tabulated data which was published by The Institute of Gas Technology in 1958. The Set Pressure values for which known data are available are shown below. Please note that Set Pressures can be also entered in kPa or bar equivalents.

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Operating Pressure Range	Available Set Pressure Increments
0 to 50 psig	10 psig
75 to 300 psig	25 psig
350 to 500 psig	50 psig
600 to 1000 psig	100 psig
1200 to 1500 psig	300 psig

The Cermax will allow entry of any Set Pressure value but will default to the nearest pressure for which data exists. For example, if the user enters 13 psig (or the bar or kPa equivalent) the nearest pressure for which data is present is 10 psig; therefore the Cermax will default to this pressure value. Similarly, if 540 psig is entered, the instrument will use data for 500 psig. If possible, it is recommended that the user configures their system such that the gas sample pressure is set to a pressure for which published data exists.

3.5.6 Selecting Sensor Options

This option allows a pressure compensated Dewpoint to be calculated and displayed on the Auxiliary Display with respect to the sensor being at either atmospheric pressure or the previously set pressure value.(see 3.5.4). Press the ↓ key to scroll down the screen to **Sensor**. The **Sensor** option is available Only if **Set Press** has been selected. It is not available if **%RH** is selected as the Main option. If either **g/m^3** or **lb/mmscf** are selected as the Main option, the sensor option defaults to **At Press** and may not be changed. Move to the required **Sensor** sub menu option by pressing the → key. Select the option required by pressing the **SELECT** key.

```
AUX DISPLAY    LOGGING     MAIN DISPLAY
Set Temp
Set Press
Sensor ✓     At Press✓At Atm
```

Figure 19. Selecting Sensor Options

3.5.7 Selecting Display Options

This option allows the user to display the compensated Dewpoint or the set pressure value on the Auxiliary Display. Press the ↓ key to scroll down the screen to **Display**. The **Display** option is available ONLY if **Set Press** has been selected. It is not available if **%RH** is selected as the Main option. If either **g/m^3** or **lb/mmscf** are selected as the Main option, the Display option defaults to **Press** and may not be changed. Move to the required **Display** sub menu option by pressing the → key. Select the option required by pressing the **SELECT** key.

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```
AUX DISPLAY      LOGGING      MAIN DISPLAY
 Set Press
 Sensor
 Display     Press✓ DP
```

Figure 20. Selecting Display Options

```
                              DP @ Pressure
                                     36.5°C
     10.2°C DP
          FIELD MODE     CAL DUE 04:98
```

Figure 21. Auxiliary Display Showing Pressure Compensated Dewpoint

```
                              Set Pressure
                                  550 PSIG
     10.2°C DP
FIELD MODE     CAL DUE 04:98
```

Figure 22. Auxiliary Display Showing Input Pressure

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3.6 Logging Menu

The CERMAX I.S. logging function has the facility to log up to 10,000 measurements in a maximum of 1000 test files. These files are stored on board and may be downloaded, when required, to a PC via the serial link cable. The data is formatted using Tab separated variables so that it can be viewed on the terminal or downloaded to a spreadsheet package. *(For information on downloading, see section 3.7 Serial Communication)*

The **LOGGING** menu allows the user to configure how data is to be logged. The options are:

Test No. This field displays the number of the test file currently displayed and the total number of tests so far recorded.

Text. Allows the user to name a test with a text string (entry optional).

Interval. Sets the time interval between the logging of data points.

Samples. Sets the total number of data points to be logged.

Start/Stop. Starts and stops the data logging function and also allows a delayed start time to be set.

Press the ↓ key to scroll the logging options up the screen.

```
LOGGING    MAIN DISPLAY     AUX DISPLAY
Test No.
Text
Interval
```

Figure 23. Logging Menu

```
LOGGING    MAIN DISPLAY     AUX DISPLAY
Interval
Samples
Start/Stop
```

Figure 24. Logging Menu (further options scrolled up screen)

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3.6.1 Test No.

The **Test No.** field displays the number of the Test file currently displayed on the Logging screen. If the logging database contains no files, the field will display **Test No 0**. If previous tests have been logged a new sequential **Test No.** is automatically generated when a new logging session is started and no selection is required.

3.6.2 Entering a Text Identifier

You may enter a text identifier of up to 15 characters, including "/" and " -". Move to the Text field by pressing the ↓ key. Press the → key to begin entering text. The numeric keys each provides three additional characters. To enter a number, press the key once. To enter one of the alternative characters, continue pressing the key until the required character is displayed. Press the **SELECT** key to accept the displayed character and move on. To finish entering text, press either the → or ↓ key.

```
LOGGING     MAIN DISPLAY      AUX DISPLAY
Test No.
Text         QUALITY TESTS 3
Interval
```

Figure 25. Entering a Text Identifier

3.6.3 Setting the Sample Interval

The sample interval defines the frequency of sampling in minutes. Move to the sampling interval required by pressing the → key. Select the interval by pressing the ↓ key. Press the **SELECT** key to finish and leave the field.

```
LOGGING     MAIN DISPLAY      AUX DISPLAY
Test No.
Text
Interval     1✓2 3 5 10 15 30 45 60 min
```

Figure 26. Setting the Sample Interval

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3.6.4 Entering the Number of Samples Required

To enter the number of samples field, press the ➔ key. Enter the number of samples required. The maximum number of samples that can be entered for a single test is 999. The logging database can store a maximum of 10,000 samples. If the number of samples entered for the current test file will not fit in the remaining logging memory, the sample number field will display the maximum number of samples allowed. The user may accept this number or enter a smaller number.

Press the ➓ key to move to the next field. When a test is stopped or reaches the end the **Samples** field will return 0.

```
LOGGING     MAIN DISPLAY      AUX DISPLAY
Text
Interval
Samples      25
```

Figure 27. Example: Entering a number of Samples of 25

3.6.5 Starting a Logging Session

The user must enter the number of samples to be logged before selecting a delayed start time or starting a logging session. All other fields are optional. The interval will default to the current setting. Logging may be started immediately or delayed until a pre-set time.

3.6.6 Immediate Start

Scroll down to the **Start/Stop** option in the menu by pressing the ➓ key. Move to the **Start** field by pressing the ➔ key and select **Start** by pressing the **SELECT** key. Logging will start immediately.

Press ➓ then **DISPLAY** to return to the Main screen. Pressing **DISPLAY** again will toggle between the Main screen and the Logging screen.

```
LOGGING      MAIN DISPLAY      AUX DISPLAY
Interval
Samples
Start/Stop  Stop Start✓Delay Start 00:00
```

Figure 28. Start Logging Immediately

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3.6.7 Delayed Start

Enter into the **Delay Start** field the actual time the data logging function is required to start. (expressed in 24 hour format) Example: If local time is 8:00am and data logging must begin in 2 hours 30 minutes time, enter **10:30** into the **Delay Start** field. If data logging must begin in 9 hours time, enter **17:00** (5:00 p.m.) into the **Delay Start** field.

Scroll down to the **Start/Stop** option in the menu by pressing the ↓ key. Move to the **Delay Start** field by pressing the → key. To change the delayed start time, press the **SELECT** key. The cursor will move to the hours field. Increment the hours by pressing the → key. Accept the displayed hour by pressing the **SELECT** key. The cursor will move to the minutes field. Increments of 15 minute blocks can be selected by pressing the → key. Accept the displayed minutes by pressing the **SELECT** key. The delayed start time is now selected and logging will begin at the pre-set time.

Press ↓ then **DISPLAY** to return to the Main screen. Pressing **DISPLAY** again will toggle between the Main screen and the Logging screen.

```
LOGGING    MAIN DISPLAY     AUX DISPLAY
Interval
Samples
Start/Stop Stop Start Delay Start✓14:30
```

Figure 29. Example: Selecting Logging With a Delayed Start Time at 14:30 (2:30p.m.)

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3.6.8 Stopping a Logging Session

A logging session will automatically terminate if

a) The set number of samples has been completed
b) CERMAX I.S. is powered down

You may also terminate a session manually. Scroll down to the **Start/Stop** option in the menu by pressing the ↓ key. Move to the **Stop** field by pressing the → key and select **Stop** by pressing the **SELECT** key. If in progress, logging will stop immediately. If **Delay Start** has been selected, the delayed start will be canceled.

```
LOGGING      MAIN DISPLAY AUX DISPLAY
Interval
Samples
Start/Stop Stop✓Start Delay Start 14: 30
```

Figure 30. Stopping a Logging Session

3.6.9 No Logging Data

If there is no logged data to view, the Logging Display will display the current date and time and state that no logged data is available. If not correct, you may change the date and/or time using the terminal commands (*see section on Communication)*

```
Date 04:14:97
 Time 14:48
 NO LOGGED DATA AVAILABLE
```

Figure 31. Logging Display With no Logged Data Available

3.6.10 Viewing Logging Display

The user may view either previously or currently logged data on the Logging screen. The logging screen will indicate the amount of logging memory used and is expressed in percentage terms. (Refer to Section 3.7 Serial Communication for further information regarding the down loading of logged data to a PC and for the clearing the logging memory). The figure below shows a typical logging screen and all the information which will be recorded during a logging session.

If logging is in progress, the samples will be automatically scrolled up the screen as they are recorded.

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Time stamp

```
Test Pt:20 QUALITY TEST 3   04:14:97 15%
No   Time      Frostpoint °C   PSIG
75  17:33        -15.34         0.0
76  17.34        -15.35         0.0
```

Memory gauge

Figure 32. Logging Display

3.6.11 Selecting Samples to View

During an active logging session only the last 4 samples logged will be displayed on the screen. When a new sample is recorded the screen will update, showing the new sample on the bottom line of the display plus the previous three samples above it. A previously logged sample that is not currently shown on the screen may be viewed by pressing the **SELECT** key, entering the number of the sample to be viewed and by pressing the **SELECT** key again. That sample number will now be shown on the top line of the display.

The data can then be scrolled through using the ↓ key. If when scrolling through data the last sample is reached, pressing the ↓ key will scroll back to the first sample logged. If, during an active logging session, previously recorded samples are being viewed, when the next sample is logged the screen will automatically update and display the latest logged sample.

```
Enter  Sample  No:5      04:14:97 17%
No   Time      Frostpoint °C  PSIG
75  16:23        -15.38        0.0
76  16:24        -15.40        0.0
```

Figure 33. Example: Selecting Sample No: 5 to View

3.6.12 Selecting and Viewing a Previously Logged Session

The user may view logged data from a previous test providing a logging session is not in progress. To select a previously logged session move down to the **Test No** field by pressing the ↓ key. Press the → key and enter the number of the test to view. Press the ↓ key or the → key to leave the field.

Press the **SETUP** key then the **DISPLAY** key to return to the Main screen. Press the **DISPLAY** key again and logged data of the selected session will be displayed.

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```
LOGGING     MAIN DISPLAY      AUX DISPLAY
 Test No.     5
 Text
 Interval
```

Figure 34. Example: Selecting Previously Logged Session 5

```
Test Pt:5  QUALITY TEST 1   04:14:97 9%
No   Time       Frostpoint °C  PSIG
0  16:23        -23.39          0.0
1  16.24        -24.40          0.0
```

Figure 35. Example: Viewing Previously Logged Session 5

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3.7 Serial Communication

The CERMAX I.S. uses an RS232 serial interface to communicate with a standard terminal operating at 9600 baud, 8 data bits, 1 start bit, 1 stop bit, no parity.

Using a set of terminal commands you can:

- Change the instrument mode of operation
- Set a customer defined unit ID
- Define the keyboard response times
- Set the date and time
- Set the time to US or European format
- Download logged data for viewing on the terminal or importing into a spreadsheet
- Clear the Logging memory after a download

To confirm communication, connect the terminal to the CERMAX I.S. and switch on the CERMAX I.S. You should see an opening message like this:

```
KAHN INSTRUMENTS, INC.
CERMAX I.S. UNIT ID
SERIAL NO. C123 C45
SOFTWARE VERSION B1.80.00 IS (or latest version)
:>
```

To view a list of available commands, type **HELP**.
You will see the user menu like this:

```
CLCK?          READ THE REAL TIME CLOCK
DATE=xx:xx:xx  SET DATE
TIME=xx:xx:xx  SET TIME
LANG=US        US SETUP
LANG=UK        UK SETUP
KDLY=xx        SET KEY REPEAT DELAY IN 10mS UNITS (DEFAULT
               100mS)
KRPT=xx        SET KEY REPEAT RATE IN 10mS UNITS (DEFAULT
               100mS)
ERAS           CLEAR THE LOGGING MEMORY
FIELD          SPOT CHECK MODE
LABUSE         LABORATORY MODE
ID=            ENTER A MACHINE ID (MAXIMUM 20 CHARACTERS)
LOAD           DOWNLOAD LOGGED DATA TO TERMINAL
:>
```


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3.7.1 Using Terminal Commands

Function	Enter	Response
Read the clock	CLCK?	DATE IS 06:14:97 TIME IS 16:43:15
Set the date	DATE=07:14:97	DATE IS 07:14:97
Set the time	TIME=10:30:00	TIME IS 10:30:00
Set the language format UK format = DDMMYY US format = MMDDYY	LANG=UK or LANG=US	LANGUAGE = UK or LANGUAGE = US
Select Field Mode	FIELD	UNIT CONFIGURED FOR SPOT CHECK
Select Laboratory Mode	LABUSE	UNIT CONFIGURED FOR EXTENDED MEASUREMENT MODE
Set the key repeat delay This changes the response speed of the CERMAX I.S. keyboard. The delay time is entered in 10mS increments. The default is 100mS	KDLY=10	INITIAL KEY REPEAT DELAY SET TO 100 mS
Set the key repeat rate This changes the response speed of the CERMAX I.S. keyboard. The delay time is entered in 10mS increments. The default is 100mS	KRPT=10	KEY REPEAT INTERVAL SET TO 100 mS
Download logged data to a PC Downloading may not be done if logging is in progress. During downloading, all other CERMAX I.S. functions are suspended.	LOAD	DOWNLOADING LOGGING FILES - PLEASE WAIT... DOWNLOAD SUCCESSFUL
Clearing the logging memory This command will delete all logged data stored in the CERMAX I.S. on board memory. Once cleared, it cannot be recovered.	ERAS	CLEARING THE LOGGING MEMORY WILL TAKE A FEW SECONDS - PLEASE WAIT.... LOGGING MEMORY CLEARED
Enter a machine identifier	ID=FRED	Unit ID is FRED

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3.7.2 Downloading Logged Data

To down load logged data from the CERMAX I.S. instrument to a PC with MS Excel using Windows HyperTerminal program follow these steps.

1) Remove the RS232 port cover, located next to the sample in & out ports, by releasing the two retaining screws. Connect the Opto Serial Link cable to the RS232 port of CERMAX I.S. Connect the other end of the Opto Serial Link cable to the COM 1 port of the PC.

2) Switch on the CERMAX I.S. instrument.

3) Access the HyperTerminal software on the PC from Windows Accessories.

To set-up HyperTerminal with the correct protocol settings to communicate with the CERMAX I.S. instrument follow these instructions:

a)Double click on *'Hypertrm'* icon
b)Connection Description:
Enter New Connection Name: *CERMAX I.S.*
Select an icon
Click OK
c)Phone Number:
Connect Using: Direct to Com 1
Click OK
d)COM 1 Properties:
Port Settings:

Bits per Second:	*9600*
Data bits:	8
Parity:	None
Stop bits:	1
Flow control:	Xon, Xoff or None

Click OK

4)To perform a data transfer:
a)Select *Capture text* from the *Transfer* drop down menu.
b)Enter file location and file name *c:/filename.TXT*
Note: Select a file location, choose your own filename, a text TXT file extension should be used.
c)Select *Start*
d)Type: *LOAD,* return
e)Wait until file transfer complete
f)Click *Stop*

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5)Open Excel.

a)Click File, Open.
b)Select file at *c:\filename.TXT*
c)Select Type of Files: Text files
d)Click Open

6)Follow the Text Import Wizard to select an area of data to be transferred and to select the column and date formats. Down loading is now complete.

UNIT ID FRED

Test Pt:0 MY TEST 15:04:97

No	Date	Time	LB/MMSCF	PSIG
0	05:14:97	14:59	2.30	1000.0
1	05:14:97	15:00	2.31	1000.0
		|		
		|		
8	05:14:97	15:02	2.28	1000.0
9	05:14:97	15:03	2.28	1000.0

Example of downloaded data as viewed on the terminal.

3.8 Charging

IMPORTANT NOTICE.

The battery charger supplied with CERMAX I.S. is not suitable for charging batteries in a Hazardous Location and charging must be performed in a Non Hazardous Location. The use of battery packs other than those designed for, and supplied with, the CERMAX I.S. instrument will invalidate product Certification.

The CERMAX I.S. unit is powered by a rechargeable, detachable battery pack. The battery pack may be recharged by removing the battery pack from the instrument and charging via the supplied battery charging unit. CERMAX I.S. will display a Low Battery Warning on the main display screen if the power falls below the minimum recommended operating level.(see Figure 3). When the Low Battery Warning is displayed, Batteries should be recharged at the earliest convenient time. Extended continuous use of instrument in the Low Battery power condition will cause the unit to Power Down. The normal maximum duration for a full recharge of a fully depleted battery pack is 12 hours. The connector for charging the battery pack is clearly identified by a label on the battery pack itself.

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If battery packs become deeply discharged, and remain so for extended periods, their ability to accept a recharge will be seriously affected. If recharging of deeply discharged battery packs is successful, charging times will be greatly extended.

Spare battery packs for CERMAX I.S are available as optional extras. The use of battery packs and charger systems other than those supplied with the CERMAX I.S. instrument will invalidate the product Warranty and further could result in permanent damage to the instrument. Kahn Instruments will only accept Warranty claims for CERMAX I.S. Battery Packs if after examination a component failure other than the Batteries themselves is in evidence and that any recharging of the batteries has used only the supplied charging unit. For further details please contact Kahn Instruments Technical Support.

Do not short circuit the batteries.

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4. MECHANICAL INSTALLATION

4.1 General

If the instrument has been supplied with optional accessories, please check that all the components listed on the packing list are present.

4.2 Sampling Hints

The Ceramic Sensor within CERMAX I.S. is designed to operate in a flowing gas stream. It is provided with a sensor sampling block that will enable a small sample of process gas to be diverted past the sensor before returning to the main gas stream or being bled off to atmosphere.

The general rules to be adhered to when arranging a sampling system are as follows:

a) Ensure the sample is representative of the gas under test. The sample point should be as close to the critical measurement point as possible. For example in a glove box application, take the sample close to the exit of the glove box or at the point where work is being carried out, not at the gas entry point.

b) Minimize volume in sample lines and potential for moisture ingress through fittings. Try to avoid too many tee pieces or unnecessary tubing. Dead space in sample lines increases response time by holding water molecules that are then slowly released to the passing gas sample.

c) Remove any particulate matter or liquid phase components from the gas sample. Particulates traveling at high velocity can damage the sensor. Similarly, at low velocity they may build up and "blind" the sensor and reduce its response speed. Where materials such as degraded desiccant, pipe particles, rust and general debris are present, use a particulate in-line filter. A coalescing filter should be used if there is any presence of liquid or aerosol contamination. Contact Kahn Technical Sales staff for further advice.

d) Use high quality sample tubing and fittings.

CERMAX I.S. is designed for use with 1/8" stainless steel or PTFE pipe.

Always use the shortest run of tubing possible between two points. Use the lowest diameter tubing possible to reduce response time, but take care not to induce pressure differentials by aiming at too high a flow rate through small diameter tubing.

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A sampling flow between 0.5 and 5 liters per minute is recommended for the Sensor to operate correctly.

4.3 Response Characteristics

Many factors will affect the speed at which the instrument will give a satisfactory result. Of greatest importance is the use of good sampling techniques. See previous section 4.2 Sampling Hints. When the instrument is first connected, a short time period will be required for the system to reach equilibrium with the sample gas. The actual time will depend on, among other things, sample line materials, tube length and gas flow rate.

CERMAX I.S. is a portable hygrometer and, as such, has been designed to provide quick response and optimum accuracy under conditions of field use. The response characteristic of the product has been optimized for maximum accuracy between 15 and 90 minutes from connection of the gas under test. To obtain the best results it is important to connect the CERMAX I.S. onto the sample flow prior to switching on the instrument. After pressing the 'ON' button and selecting your desired operating mode, wait for the completion of the short initiation sequence. After this, the instrument display will indicate a reading which is rapidly responding to the dewpoint/moisture content being measured.

If the instrument is measuring the same gas for extended periods in excess of 8 hours, a gradual reduction of the displayed moisture content may be observed. This is due to excess desiccation of the sensor and the gas wetted components and does not indicate a fault condition.

4.4 Which Gases to Measure

CERMAX I.S., by nature of its design, is suitable for measurement of the moisture content of a wide variety of gases. In general, if the gas (in conjunction with water vapor) is not corrosive to base metals then it will be suitable for measurement by the hygrometer. However gases containing entrained solids or hydrocarbon mists should be filtered before presentation to the sensor using a coalescing filter. If only particulate matter is present in the sample line then a particulate in-line filter is all that is required. Suitable filters are available from Kahn Instruments.

If a very dry gas, which would become corrosive when coming into contact with higher concentrations of moisture, is to be measured, then the instrument must be purged with an inert gas immediately after the measurement has been made. This will prevent any potentially corrosive gases remaining in the sensor block from contaminating the sensor.

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5. MAINTENANCE

5.1 General

Routine maintenance of the CERMAX I.S. Dewpointmeter should only require regular re-calibrations. The normal calibration period is one year. The date that the next calibration is due is shown in the bottom right hand corner of the mail display. The re-calibration indicator will appear approximately six weeks from the end of the current calibration year. This re-calibration work can only be performed by exposure of the Moisture Sensor to sample gases of known moisture content. Calibration services traceable to national humidity standards are provided by Kahn Instruments. Contact Kahn Instruments or your local representative for further details.

The frequency of re-calibrations required in order to maintain the performance of the CERMAX I.S. Dewpointmeter is primarily dependent on the composition of the gas to which the Moisture Sensor is exposed, i.e. content of liquid and particulate contaminants, corrosive elements, etc. (refer to section 4 Mechanical Installation of this manual for guidance). In most applications annual re-calibration ensures that the stated accuracy of the CERMAX I.S. Dewpointmeter is maintained.

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6. TECHNICAL SPECIFICATIONS

I.S. Certification Codes:	
CSA Approval	Intrinsically Safe. Class I, Division I, Groups A,B,C,D T3C
FM Approval	Intrinsically Safe. Class I, Division I, Groups A,B,C,D T3C
C.E.N.E.L.E.C.	EEx ia IIC 155°C(T3) to B.S. EN 50 014 & B.S. EN 50 020
Sensor	Kahn Ceramic Moisture Sensor
Gas wetted components	316 stainless steel
Gas connections	1/8" Swagelok™ inlet and outlet couplings
Display	4 line x 40 character LCD
Range	Calibrated from -100 to +20°C dewpoint; readings to -120 and +30°C dewpoint
Accuracy	+/- 1°C from -60 to +20°C dewpoint; +/- 2°C from -100 to -60°C dewpoint
Resolution	0.1 °C dewpoint, 3 significant figures for other units
Units	°C, °F, K dewpoint PPM(V) PPM(W) for air, N_2, H_2, CO_2 gm^{-3} (natural gas) lb/mmscf (pounds per million standard cubic feet, natural gas)
Data storage	up to 10,000 samples of primary and secondary variable, time and date stamp and identification tag
Communications	RS232C
Power	Internal battery pack (re-chargeable by removal) charged by external AC powered 6V charger (supplied). 12 hours normal operation between charges
Case	Custom polyurethane case with integral padded carry handle
Dimensions	9.8W x 11.8D x 5.9H inches approx.
Weight	6.6 lb. (3 kg)
Ingress protection	IP65
Operating temperature	-20 to +50 °C
Storage temperature	-40 to +70 °C
Operating pressure	max 4410 PSIG (30 Mpa)
Flow rate	0.5 to 5 l/min^{-1} (1 to 10 SCFH)
Optional accessories	Carrying bag Shoulder strap Sample system Spare battery pack

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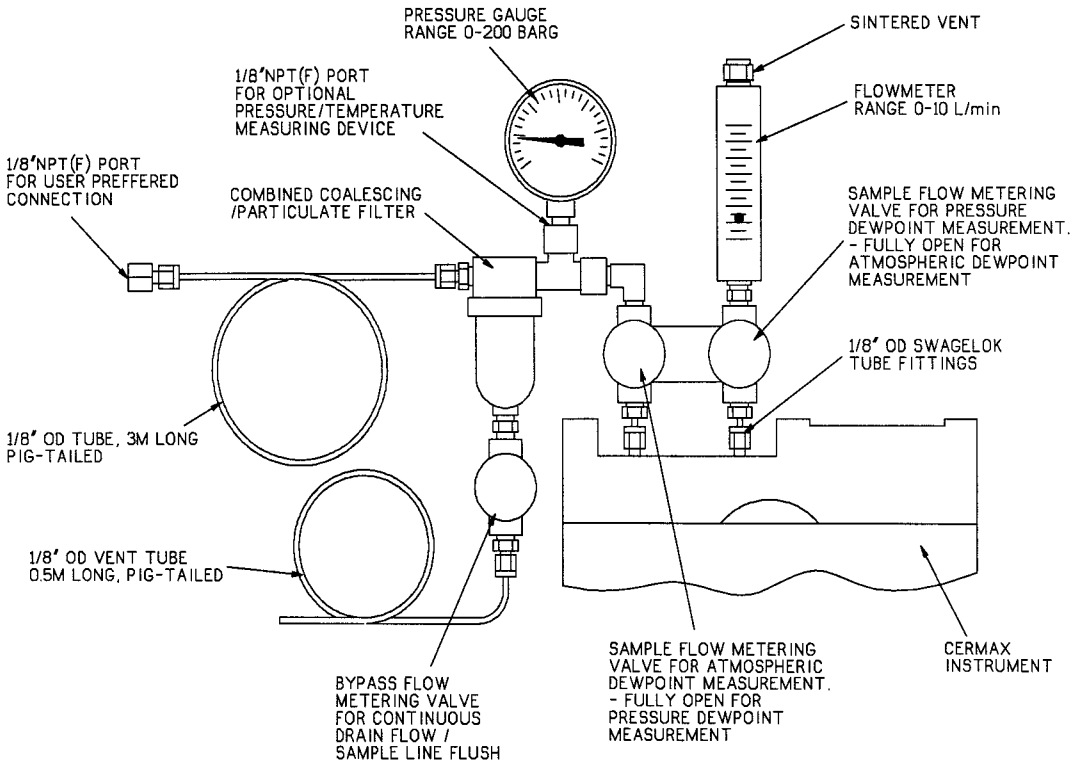
Appendix 1. RECOMMENDED SAMPLING SYSTEM

The following sampling system is recommended by Kahn Instruments for use with the CERMAX I.S. instrument. This sampling system is not included in the product Hazardous Location Certification. It is available as an optional extra. Please contact your local Kahn representative for further information.



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Appendix 2. YEAR 2000 COMPLIANCE

The software contained with in the CERMAX I.S. instrument has been designed and tested to be compatible with the date change to the year 2000.

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