CONTENTS

Unpacking Your Super-Dew

You should have received: (if ordered)

1 Super-Dew meter
1 Laboratory stand
1 Mains cable
1 Co-axial cable with connectors (2m)
1 Sensor
1 Sensor holder
1 Pressure Calculator

If anything is missing please contact your distributor immediately.

Setting Up and Initial Calibration

Firstly check that the mains rating shown on the back of the Super-Dew meter corresponds with your supply. If this is the case then connect the meter to your supply and switch on.

The Super-Dew meter can work with any sensor, and will display dewpoint in deg.C on a bright green backlit liquid crystal display.

Next we need to set the meter for the particular range of sensor which is to be used. This information will be shown on the tin which the sensor is supplied in and should conform to one of the sensors depicted in the table below.

SENSOR TYPE	DEWPOINT RANGE deg. C	MOISTURE CONTENT ppm
Purple Spot	-100/0	0-6,000
Silver Spot	-100/-20	0-1,000
Red Spot	-80/-20	0-1,000
Grey Spot	-80/0	0-6,000
Yellow Spot	-60/0	10-6,000
Blue Spot	-80/+20	0-23,000
Gold Spot	-50/+20	40/23,000
Green Spot	-30/+20	400/23,000

Dry Limit Setting

Having determined which sensor we are going to use note its dry limit e.g. for a red spot sensor this is -80 deg.C DP. With nothing but the mains connected to the meter and it switched on adjust the "DRY" potentiometer on the front of the Super-Dew until the display shows our sensors dry limit.

Wet Limit Setting (Auto-cal)

Connect the sensor to the Super-Dew using the supplied co-ax connector lead and note the wet limit of the sensor e.g. for the red spot this is -20 deg.C DP. Hold the sensor in ambient air i.e. well above 0 deg.C (typical dewpoints are around 5 - 20 deg.C DP) so the sensor should be fully saturated. Now adjust the "WET" potentiometer until the Super-Dew display reads the wet limit of the sensor i.e. -20 deg.C for the red spot sensor.

This auto-cal procedure can be followed for all sensors whose wet limit is much below ambient temperature conditions. **Silver, Grey, Red and Yellow spot sensors** should all auto-cal satisfactorily providing the ambient dewpoint is above their wet limit.

Other sensors whose wet limit is above 0deg.C DP or above ambient dewpoints e.g. **Blue, Gold and Green spot sensors** are calibrated slightly differently as these sensors do not have a designed saturation level.
The dry limit setting is carried out the same as described earlier, but the wet calibration will have to be made either in room air and if the dewpoint is known then the Wet limit potentiometer is adjusted with the sensor connected until the Super-Dew display corresponds with the known conditions.

If the room dewpoint is not known then the sensor can be calibrated using a humidity jar. Here if temperature is known then using the look up tables or graph the dewpoint can be calculated and used to set the wet limit correctly.

Typically at 20 deg.C using a 11% RH jar with the sensor enclosed within it the dewpoint on the Super-Dew should be adjusted using the Wet potentiometer until the display shows -10 deg.C, for the 54% bottle it should read +11 deg.C and for the 75% bottle the reading should be +16 deg.C

The meter is now fully calibrated and is ready for the sensor to be put in-line, either in a sensor holder or in the atmosphere it is to work in.

Calibration Routine

Frequency of user calibration can only be determined by initial frequent calibration checks to determine the degree of drift of the wet limit or auto-cal setting. We typically recommend that an auto-cal is performed every three months. and that annually or more frequently if desired the sensor is returned to us or an engineer visits you to perform a multi point calibration check across the range of the sensor and issue a NPL certificate.

The dry limit setting should not require any further adjustment after its initial setup unless a different range sensor is to be used.

Alarm Settings

The meter is equipped with two alarm relays which have the provision of normally open and normally closed contacts rated at 240V and 2A.

The setpoints of these alarms are adjusted by pressing the relevant button on the front panel of the Super-Dew and whilst holding it down adjust the relevant alarm potentiometer, the set point will be shown on the display of the Super-Dew.

Alarm Trips and Hysteresis

The Dry Alarm

This will trip at the set level as the sensor detects gas passing it which is becoming drier, a degree of hysteresis of approximately 3 deg.C DP is built in to prevent chatter of the relays around the setpoint, this means that the alarm will only reset as the sensor detects the gas passing it becoming wetter by 3 deg.C DP more than the set point.

Contacts are: 4 = Normally Open, 5 = Common, 6 = Normally Closed

The Wet Alarm

This will trip at the set level as the sensor detects gas passing it which is becoming wetter, a degree of hysteresis of approximately 3 deg.C DP is built in to prevent chatter of the relays around the setpoint, this means that the alarm will only reset as the sensor detects the gas passing it becoming wetter by 3 deg.C DP less than the set point.

Contacts are: 7 = Normally Open, 8 = Common, 9 = Normally Closed

Analogue Outputs

The 4-20mA Output

This is available at pins 2(+VE) and 3(-VE) at the rear of the Super-Dew on the analogue output port:

4mA occurs at the dry limit which the meter was initially set to e.g. -100 deg.C DP for a silver spot sensor.

20mA is factory set to occur at the Wet limit or Auto-cal setting for the sensor range ordered e.g. –20 deg. C DP for a silver spot sensor.

Should the 4-20mA range require adjustment due to selection of a different sensor range this is adjusted by removing the front panel of the meter and setting the dry limit of the sensor to be employed as described earlier and then connecting either a sensor or an 8.6K load to the co-ax socket, using the wet adjuster at the front of the meter set the mA output to 20mA, then adjust the trimpot RV6 TRIM WET located just to the left of the "WET" or AUTOCAL adjuster until the display of the Super-Dew reads the Wet limit of the sensor being employed. Replace the front panel of the meter and it is now ready for operation.

The mA output is linear with dewpoint across this range. It is a current source and must be sunk into a load of no greater than 500 ohms, this assuming good quality low loss signal cable is used, the internal supply for the mA output is a DC supply of 15 volts. An external supply can be connected observing correct polarity in order to increase the output voltage giving greater flexibility to interface with a range of data capture systems.

The 0-1V Output

This is available at pins 3(-VE) and pin 1(+VE) at the rear of the Super-Dew on the analogue port. The 0-1V is proportional to the 4-20mA output which is in turn proportional to the sensor range and is reset if required in the same manner as the 4-20mA setting detailed above in the 4-20mA section.

PROBLEM SOLVING

ANY PROBLEMS?

1. Superdew - check that the meter indicates dry setting when the coaxial lead is not connected. .

2. Superdew - check that the meter reads up to 200 and then 1 - (Overload) when a short circuit is applied to the coaxial cable.

PROBLEM: Coaxial Short Circuit

a) Remove sensor and lead from the hygrometer.
b) Note the reading is correct for the dry setting (i.e. with only mains lead connected - dry dewpoint setting).
c) Refit the coax lead but do not connect the sensor.
d) There should be very little change in reading so if an overload is seen, fit a new coax lead or repair the same.

PROBLEM: Over Full Scale Reading

a) Superdew hygrometers have a limit reading of 200.
b) If '1' is indicated, turn the Auto Calibration (WET) screw anti clockwise with the sensor connected in the room air.

PROBLEM: Coaxial Cable Open Circuit

a) Remove the sensor and apply metal or a wet finger across the sensor end of the cable.
b) No reading indicates an open circuit cable or faulty connection.
c) A scale reading proves that the cable is all right.
d) If the cable is all right, the sensor when connected, should increase the reading.
e) If there is no increase in the reading, check the coax socket on the sensor top or fit a new sensor.

PROBLEM: Wet Readings - Slow Dry Down

a) Place the sensor in the desiccant tin or a dry air supply.
b) Leave overnight to dry out.

PROBLEM: Short Circuit Sensor (Indication more than full scale)

a) Remove the sensor from the coax lead.
b) Note the zero reading without the sensor.
c) Ensure that the auto calibration is not turned up to high.
d) If this does not correct the fault, contact your supplier.

Calibration Humidity Jars

a) Look inside the jar.
b) Particularly with the Lithium Chloride Jar, check if there is any liquid observed.
c) Wipe out with a tissue.
d) Always replace the cork quickly.
e) Leave for a day to settle.

GENERAL INFORMATION

THE SHAW SENSOR. DESCRIPTION, THEORY AND OPERATING CONDITIONS

The Shaw high capacitance Sensor has been undergoing continuous development since it was invented by Mr. J L Shaw in the late 1940's.

CONSTRUCTION

Construction of the Sensor starts with an ultra-high purity aluminium wire which is coated with a hygroscopic layer and finally covered by a film of porous gold. The gold film and the aluminium core form the plates of a capacitor. The capacitance value, and the change in capacitance value over the measuring range of each Sensor (which is at least 100 times greater than in any other Sensor of this type) is measured at supply frequency (50 or 60Hz) which enables long cable lengths (up to 1000M) to be used between each Sensor and the analyser without any risk of interference or pick-up from external cables or other sources. Some of the water vapour molecules in the atmosphere surrounding the Sensor will enter the dielectric layer where, due to the extremely small size of the pores, their Brownian motion will be restricted and the energy will be removed from the molecules so that they will condense into liquid water. Due to the very high dielectric constant water (about 80) compared with the other vapours which may be present, this produces a marked change in the dielectric value of the Sensor which is then measured by the analyser. A dynamic equilibrium will exist between the water vapour outside the Sensor and the condensed water within the pores. This equilibrium is maintained, and the response time of the Sensor can generally be considered to be at least as quick as the system into which it is installed.

Molecules larger than water vapour (which is one of the smallest gas molecules) cannot enter the pores, making the Sensor resistant to many contaminants and specific to water vapour pressure regardless of the carrier gas. (Molecules of gasses such as Hydrogen will enter the Sensor pores, but their dielectric strength is small enough that no measurable change occurs in the sensor).

TEMPERATURE

Shaw Sensors are designed to work at normal room temperature. Our long experience of exporting to countries throughout the World has shown that ambient temperature variations can safely be ignored for all practical purposes, so long as the temperature range for each Sensor given below is not exceeded. In particular, avoid placing any Sensor in direct sunlight or near a source or radiant or convected heat.

OPERATING TEMPERATURE

SENSOR TYPE	MIN. TEMPERATURE	MAX. TEMPERATURE
Red Spot Sensor	-35 deg. C	+40deg. C
Grey Spot Sensor	-35 deg. C	+40deg. C
Yellow Spot Sensor	-35 deg. C	+40deg. C
Gold Spot Sensor	+5 deg. C	+35deg. C
Green Spot Sensor	+5 deg. C	+35deg. C

HAZARDOUS AREA INSTALLATION

The Shaw Sensor has been approved for use as part of an intrinsically safe circuit. This means that it may be installed in an area where there is risk of fire or explosion. The instrument must be located in a safe area, and the length of coaxial cable between the instrument and the Sensor must not be no more than 300 meters. In addition, a Zener Barrier Unit must be installed in the safe area and connection between the instrument and its Sensor.

The Zener Barrier Unit is a device which limits the amount of energy which can reach the Sensor, even in a major fault condition, to less than that required to cause a spark which could ignite the explosive gas.

CONSTANT TEMPERATURE UNIT

This is used in place of the Sensor holder when there is a risk of condensation on the Sensor due to a wide ambient temperature variations or, in non-standard applications, when the gas dewpoint temperature may be higher than the ambient temperature. It should be used in exactly the same way as the Sensor holder, and the thermostat should be set to the temperature on the information supplied with the Sensor.

INSTALLATION CONDITIONS-SENSOR

PRESSURE

The Shaw Sensor is a water vapour pressure detector. This means that it is sensitive to its operating pressure. However, dewpoint temperature is directly proportional to pressure (as the pressure of a gas is increased the dewpoint temperature increases to a wetter level) and so the dewpoint temperature readings given by the instrument remain correct regardless of the pressure at which the Sensor is used.

Although Shaw Sensors are in regular use at up to 400 bar it is generally preferred that the Sensor be operated at 1 bar (A). The advantages of this are that the readings will not be affected by changes in the gas pressure in the main pipe. However with a typical line pressure of about 7 bars the sensor will never be exposed to free water, even under major fault conditions. As the sample of gas at 1 bar will have a dewpoint temperature of only about 0 deg.C. This means that the instrument readings continue to give useful information and recovery of the Sensor after the fault condition has been cured will be very much quicker. The Sensor is a water vapour pressure detector, and free water is an enormous overload. Contamination of the Sensor with free water will, at best make calibration suspect and should be avoided. This is true for all electronic Sensors, regardless of the exaggerated claims made by some of the less scrupulous manufacturers.

If readings at line pressure are necessary, we can supply a special scale which will show the line pressure dewpoint temperature with the Sensor operating at 1 bar. The line pressure must be reasonably constant for this to be satisfactory. Alternatively, if the Sensor is operated at line pressure, the standard scale will indicate the correct dewpoint temperature at that pressure directly without correction.

VACUUM

As stated above the Shaw Sensor is a water vapour pressure detector. It therefore follows that it will operate under vacuum and continue to indicate correctly the water vapour pressure which remains. As with high pressure operation it is important to remember that the vpm scale is only correct with the Sensor operating at 1 bar. The dewpoint temperature readings remain correct regardless of the system pressure or vacuum.

Also remember, when changing the pressure in systems containing small amounts of water vapour, that a new equilibrium must be established at a new pressure before the final reading will be obtained. Out-gassing or absorption of the water vapour molecules from the pores of the materials out of which the system is constructed can cause a considerable time delay some times leading to unexpected results.

RESPONSE TIME

The response time from dry to wet of all Shaw Sensors is a maximum of 30 seconds for 90% of a step change, depending very much upon the moisture level and the temperature. The response from wet to dry depends very much upon the operating conditions, and will be effected by the Sensor, the gas temperature and pressure and the sample flow rate. In general the Sensor is able to establish a new equilibrium water vapour pressure after a change of conditions almost as quickly as the system in which it is installed.

In order to obtain the best possible system response time it is important to design the sample system carefully. Use the smallest sample pipe possible (we usually suggest 1/8" o.d.) and use the shortest possible length. It is always preferable to use a longer coax cable to the Sensor, than a long sample pipe from the sample point. The sample flow rate should be adequate for the size of sample system: for an average installation having perhaps 2 metres of 1/8"o.d. pipe before the Sensor, a flow rate of about 1 L/min. is quite sufficient. If a longer sample pipe is used, then the sample flow should be increased. If necessary install a by-pass type system.

When the system is installed and a stable reading has been obtained increase the sample flow rate TEMPORARILY, and if a drier reading occurs, it indicates that the original flow rate was too low, or that there is a leak in the system allowing ambient moisture into the sample.

IMPORTANT

Shaw Sensors are suitable for many different industrial and research applications. Most gases can be checked for their moisture content, and there is no need for the calibration to be altered when changing between different gases - even such different gases as carbon dioxide and hydrogen: the Sensor operates only with reference to the water vapour content.

There are some gases which must be avoided as they are not compatible with the materials of construction of the Sensor. Ammonia and Chlorine must be avoided at all times, even in small quantities. HCl also attacks the Sensors very quickly. Gases such as sulphur dioxide (SO2) can be monitored, provided the moisture content is typically < 100 VPM. If in doubt, please check with us first.

GUARANTEE

All Shaw products are guaranteed for two years (with the exception of Low Spec and economy sensors which are covered by a six month guarantee) 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 voltage to meters.

SENSOR CABLE

The Sensor cable which is used to connect the Sensor to the instrument must be of the coaxial type and have an impedance of 75ohms and a capacitance of 50pF of less per metre which is available from us in 100, 250 and 500 metre lengths, it is possible to position the Sensor up to 1000 metres away from the instrument. Instruments are despatched with a standard length of 2 metres of cable unless otherwise requested.

BASIC DEFINITIONS

WATER VAPOUR PRESSURE

Is 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 pressure.

RELATIVE HUMIDITY

Is the ratio of the actual water vapour pressure to the saturation water vapour pressure at the same temperature.

DEWPOINT TEMPERATURE

Is defined as 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 deg C and ice below
0 deg 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.

SAMPLING SYSTEMS SU4 & SWS

There are two basic types of sampling systems available.

1). The first being a simple system known as the SU4 Lo, Med or Hi which consists of a pressure regulator to reduce a maximum input pressure of 20 Bar (Lo), 200 Bar (Med) or 400 Bar (Hi), a flow indicator / regulator and a sensor block all mounted on a backplate.

2). The second being somewhat more sophisticated being housed in an IP66 rated polycarbonate cabinet (or a stainless steel Ex rated cabinet) and known as the SWS (Ex) Lo, Med or Hi, consisting of the above SU4 main parts but with the inclusion of a filter unit and sample selection valve enabling either sample gas or purge gas to pass the sensor and the possible inclusion of the meter detailed in the relevant manual, i.e. SWS (Ex)-SD-Lo, Med or Hi.

SAMPLE SYSTEM INSTALLATION AND SET-UP

In the case of the SWS make all necessary pipework and wiring connections if appropriate according to the drawing at the end of the relevant meter manual titled SWS-(meter name) External Piping and Wiring Schematics (for SU4 and SWS connect the input to the sample pipe) and after calibrating the sensor install it into the sensor holder.

For all sample systems ensure that the sample pressure is not greater than the rating of the input pressure regulator. Lift the Black Knob which unlocks the knob (20 Bar regulator only) and turn the regulator(s) fully anti-clockwise to close the regulator(s), then turn the flow indicator regulator fully anti-clockwise to fully open it.

Open the isolator valve and check for leaks on the input connection, if there are none turn the sample selection valve towards the Sample Inlet (SWS only), noting that the arrow on the valve points in the direction from where the sample is coming from! Now turn the pressure regulator control slowly clockwise until a flow of 5 - 10 litres/minute is seen at the flow indicator. (Where two regulators are fitted open the low pressure regulator first, this is the regulator with the red locking ring). Push down the Black Knob locking ring (20 Bar regulator only) and turn the flow indicator control slowly clockwise to reduce the flow seen at the flow indicator to between 3 and 5 litres / minute. Check the sensor to sensor block seal for leaks and if there are none the sample system is now ready for operation.

MAINTENANCE

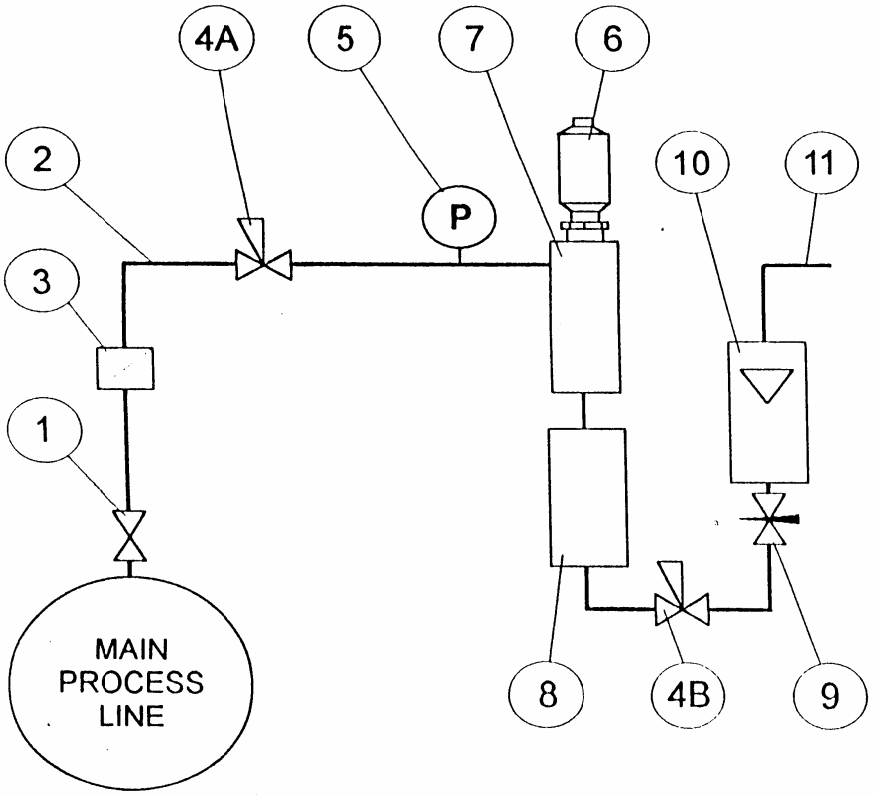
Periodically check the flow indicator to ensure a steady flow is maintained and check the filter unit cartridge from time to time as a contaminated filter will reduce the response of the system to varying dewpoints. Frequency of any check can best be determined by the operator who will be able to judge the likelihood of adverse conditions which may cause a deterioration of performance.

Super-Dew Specification

Accuracy (meter):	1% across meter range.
Type:	In-line hygrometer in plastic DIN style case, for panel mounting or table top use.
Dimensions / Weight:	Overall dimensions: Panel cut-out 135mm x 66mm x 175mm depth Weight: 570g approx.
Display:	Backlit 2cm LCD digital indicating meter showing Dewpoint Deg. C only. (Deg. F. available by special order).
Sensor Connection:	Low loss co-ax cable (75ohms max capacitance of 50pF per metre). Sensor location upto 1000m from meter except after Zener Barrier then 300m.
Power Supply:	110 or 220 V a.c. single phase 50 or 60 Hz, 24 V d.c.
Sampling:	Pressure: Upto 200 Bar but preferably atmospheric with flow rate of 1 - 5 litres/minute in Shaw Sensor Holder.
Outputs:	Alarms:2 Relays rated at 240V 3A Analogue: 4-20mA and 0-1 V, others by special request
Calibration:	Autocal on all but Gold and Green range.
Accessories / Options:	Zener Barrier Unit ZBU for intrinsically safe operation in hazardous areas to Eex.ia IIC T6
	SU4 Lo, Med or Hi Sample system for sample conditioning pressurised gases to atmospheric conditions and controlled flow.
	SWS Lo, Med or Hi Sample system, as SU4 but in IP rated cabinet.

Sensor Type ®	**Sensor Range:**
Purple: **(P)**	-100 / 0 deg.C DP, 0-6000ppm equivalent, (auto-cal)
Red : **(R)**	-80 / -20 deg.C DP, 0-1000 ppm equivalent, (auto-cal)
Grey : **(GY),** lo-spec **(GEN)**	-80 / 0 deg.C DP, 0 - 6000 ppm equivalent, (auto-cal)
Yellow : **(Y)**	-60 / 0 deg.C DP, 10 - 6000 ppm equivalent, (auto-cal)
Blue : **(Bl)**	-80 / +20 deg.C DP, 0 - 23,000 ppm equivalent, (manual-cal)

Moisture Meters Ltd, Westgate, Bradford, BD1 3SQ, England
Tel ++44(0)1274 733582, Fax: ++44(0)1274 370151, e-mail: mail@shawmeters.com



NOTES

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

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 3mm OD (1/8") is sufficient as it provides good system response time with minimum flow. 6mm OD (1/4") tube can be used where pressure drops across 3mm tube are too high.

3. Filter Unit. A filter unit is recommended when samples are likely to contain particulate matter. If the air/gas sample contains heavy hydrocarbon condensate this must be of the coalescing type with drain. The filter unit should be positioned as close to the sample point as practical.

4. Pressure reducing Valve or Pressure Regulator. If the sample is to be measured at atmospheric pressure then valve 4A should be fitted and 4B omitted from the system. If the sample is to be measured at full line and the exhaust vented to atmosphere then valve 4B should be fitted and 4A omitted from the system.
   If measurements are to be taken at full line pressure and the sample is to be returned to a part of the main line or vent which is at a pressure higher than atmospheric and the input to that line needs a controlled pressure then both valves 4A and 4B will be required.

5. Sample Pressure Gauge. This is not a critical part of the moisture measurement but may be required if Dew/Frost point measurements are to be made at higher than atmospheric pressure.

6. Measuring Sensor.

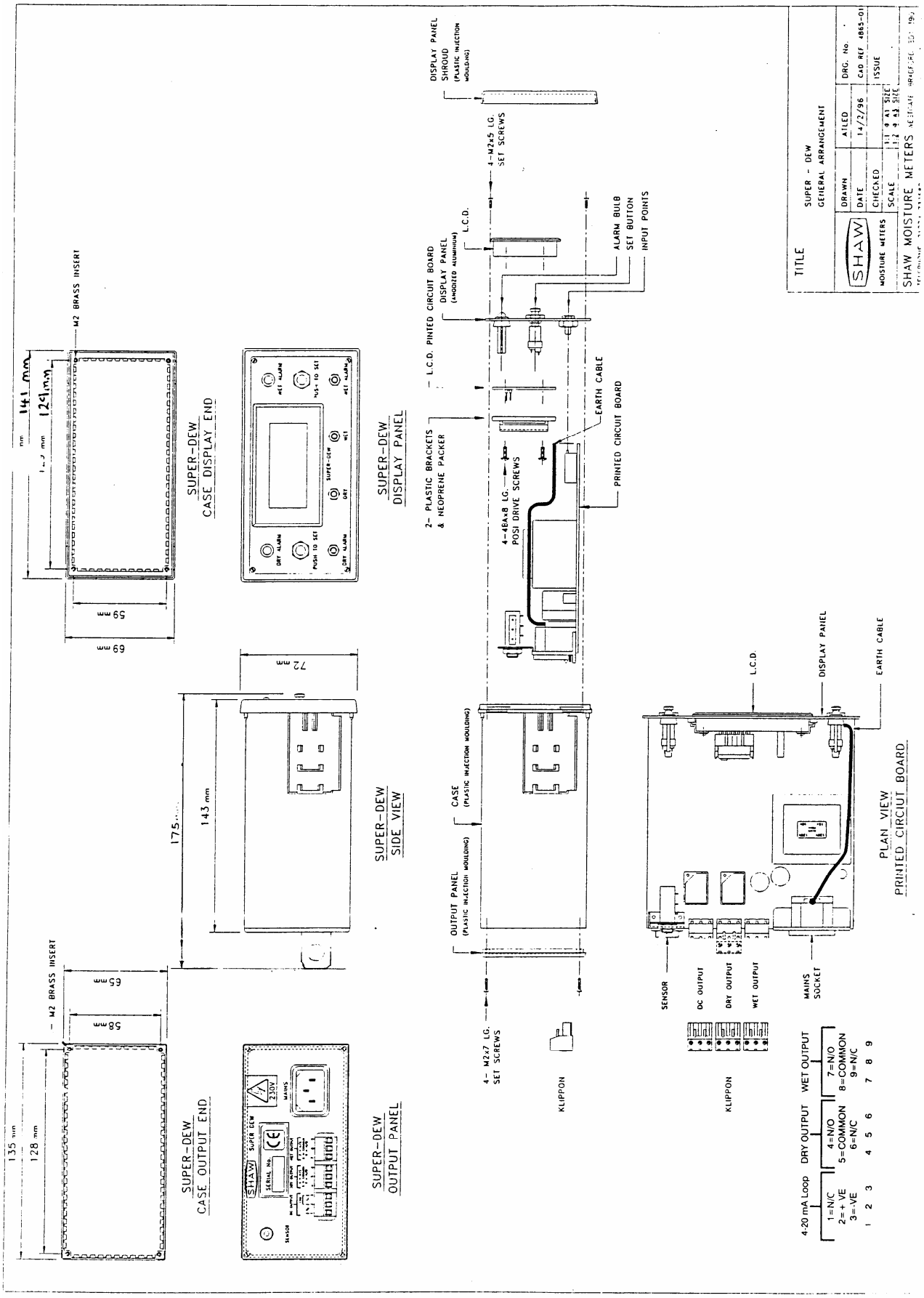
7. Sensor Holder.

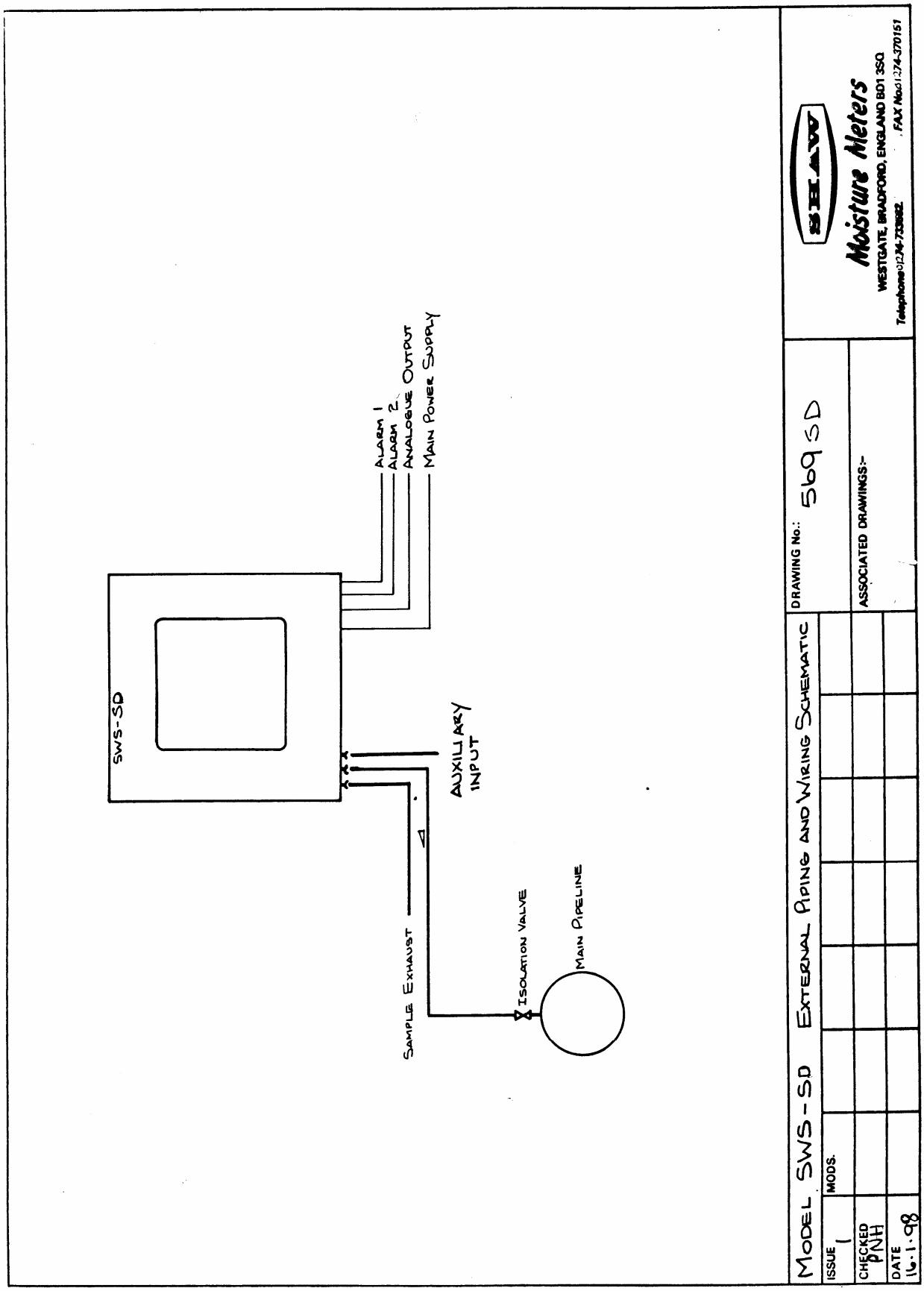
8. Desiccant Chamber. This item is only required when the sampling is to be intermittent. When installed it prevents the ingress of wet air to the sample system, while the sample is not flowing, improving response time.

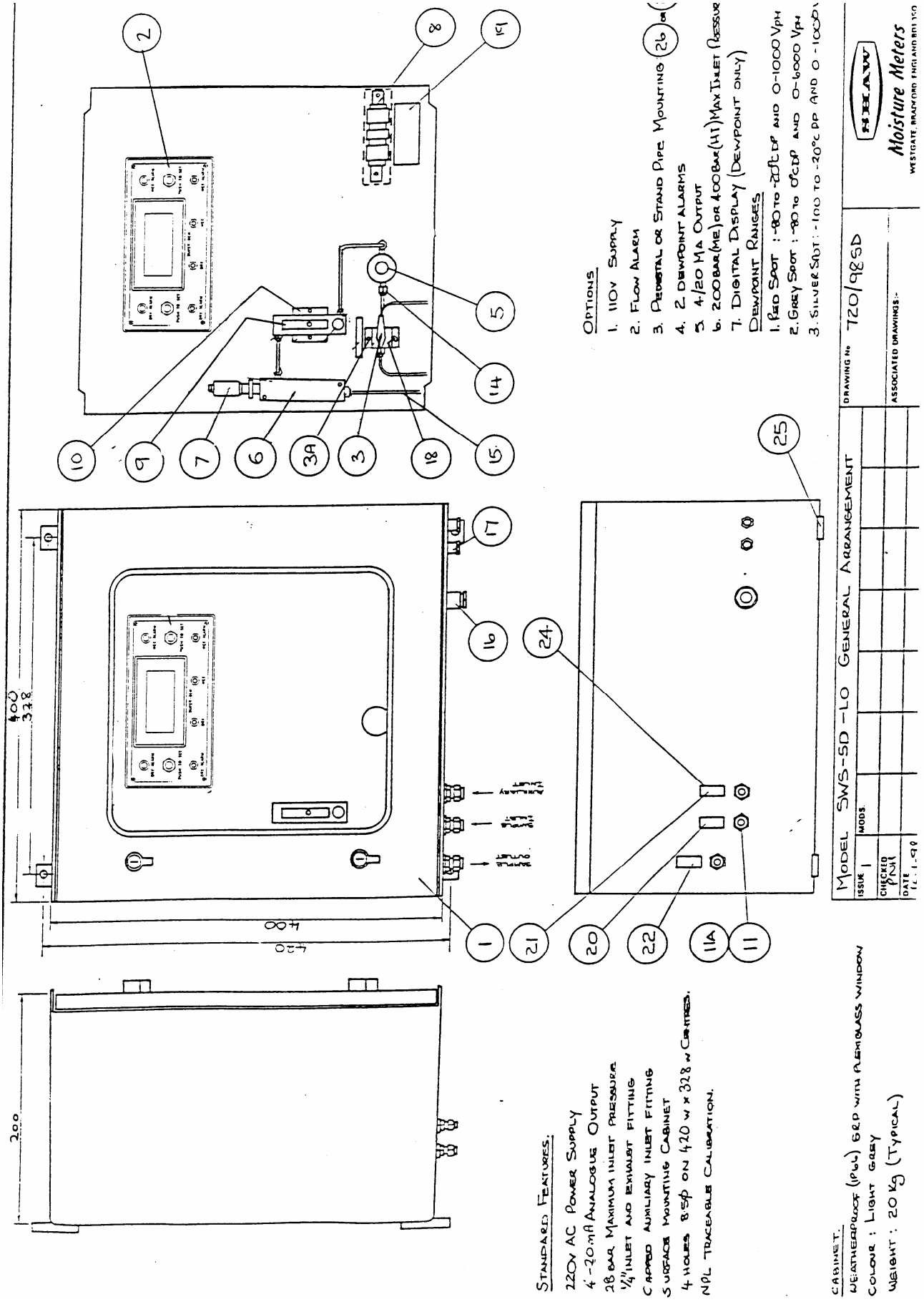
9. Flow Control Valve. This can be a separate item or combined with the flow indicator.

10. Flow Indicator. The recommended sample flow is 2/3 SL/M.

11. Sample Exhaust. The exhaust can be vented to atmosphere or returned to the process line as discussed above.


SUPER-DEW
CASE DISPLAY END
M2 BRASS INSERT
141 mm
129 mm
59 mm
69 mm
SUPER-DEW
DISPLAY PANEL
SUPER-DEW
SIDE VIEW
72 mm
175 mm
143 mm
SUPER-DEW
CASE OUTPUT END
M2 BRASS INSERT
65 mm
58 mm
135 mm
128 mm
SUPER-DEW
OUTPUT PANEL
DISPLAY PANEL SHROUD (PLASTIC INJECTION MOULDING)
4-M2x5 LG. SET SCREWS
L.C.D.
DISPLAY PANEL (ANODIZED ALUMINIUM)
L.C.D. PRINTED CIRCUIT BOARD
ALARM BULB
SET BUTTON
INPUT POINTS
2- PLASTIC BRACKETS & NEOPRENE PACKER
4-4BAx8 LG. POSI DRIVE SCREWS
EARTH CABLE
PRINTED CIRCUIT BOARD
CASE (PLASTIC INJECTION MOULDING)
OUTPUT PANEL (PLASTIC INJECTION MOULDING)
4- M2x7 LG. SET SCREWS
KLIPPON
L.C.D.
DISPLAY PANEL
EARTH CABLE
PLAN VIEW
PRINTED CIRCUIT BOARD
SENSOR
DC OUTPUT
DRY OUTPUT
WET OUTPUT
MAINS SOCKET
KLIPPON
4-20 mA Loop
1=N/C
2=+VE
3=-VE
DRY OUTPUT
4=N/O
5=COMMON
6=N/C
WET OUTPUT
7=N/O
8=COMMON
9=N/C
1 2 3 4 5 6 7 8 9
TITLE
SUPER - DEW
GENERAL ARRANGEMENT
SHAW
MOISTURE METERS
DRAWN
AILED
DATE
14/2/96
CHECKED
SCALE
DRG. No.
CAD REF 4865-01
ISSUE
SHAW MOISTURE METERS


ALARM 1
ALARM 2
ANALOGUE OUTPUT
MAIN POWER SUPPLY
SWS-SD
AUXILIARY INPUT
SAMPLE EXHAUST
ISOLATION VALVE
MAIN PIPELINE
MODEL SWS-SD EXTERNAL PIPING AND WIRING SCHEMATIC
ISSUE 1
MODS.
CHECKED PNH
DATE 16.1.98
DRAWING No.: 569 SD
ASSOCIATED DRAWINGS:-
SHAW
Moisture Meters
WESTGATE, BRADFORD, ENGLAND BD1 3SQ
Telephone 01274-733582
FAX No. 01274-370151


Options
1. 110V Supply
2. Flow Alarm
3. Pedestal or Stand Pipe Mounting (26)
4. 2 Dewpoint Alarms
5. 4/20 Ma Output
6. 200Bar(Me) or 400Bar(Hi) Max Inlet Pressure
7. Digital Display (Dewpoint only)
Dewpoint Ranges
1. Red Spot : -80 to -20°C DP and 0-1000 Vpm
2. Grey Spot : -80 to 0°C DP and 0-6000 Vpm
3. Silver Spot : -100 to -20°C DP and 0-10000
Model SWS-SD-LO General Arrangement
Drawing No 720/98SD
Associated Drawings:-
Issue 1
Mods
Checked PNH
Date 11-1-99
SHAW
Moisture Meters
Westgate, Bradford England BD1 3SQ
Standard Features.
220V AC Power Supply
4'-20mA Analogue Output
28 Bar Maximum Inlet Pressure
¼" Inlet and Exhaust Fitting
Capped Auxiliary Inlet Fitting
Surface Mounting Cabinet
4 Holes 8.5ø on 420 w x 328 w Centres.
NPL Traceable Calibration.
Cabinet.
Weatherproof (IP66) GRP with Perspex Window
Colour : Light Grey
Weight : 20 Kg (Typical)
400
328
420
200

PART Nº	DESCRIPTION	LOCATION	QUANTITY	SUPPLIERS PART Nº	SUPPLIER	QA RATING
1	WEATHERPROOF CABINET	W S	1	KS 1454	HTEL 1	A 2
1A	LOCKING HANDLES	W S	2	KS 1484	HTEL 1	A 2
2	MODEL	T R	1	DWG	IN HOUSE	–
3	3 PORT BALL VALVE	W S	1	5541 X52	MANC 1	D 4
3A	VALVE MOUNTING BRACKET	W S	1	DWG 686/90	IN HOUSE	–
4 (OPT)	FILTER UNIT	W S	1	MODEL 124P	PROS 1	D 3
4A (OPT)	FILTER CARTRIDGE	W S	1	050. 11B	PROS 1	D 3
5	PRESSURE REDUCING VALVE	W S	1	11. 990. 141	NORG 1	B 1
6	SENSOR HOLDER	W S	1	DWG 679/90	PBEL 1	B 3
7	SENSOR	L 1	1	SENSOR	ERAV 1	B 3
8	TERMINAL RAIL	W S	1	1175-0	HTEL 1	A 2
8A	TERMINALS	W S	8	02943-6	HTEL 1	A 2
8B	RETAINING BLOCK	W S	4	0924-220034	HTEL 1	A 2
8C	END PLATE	W S	4	AP 029-446	HTEL 1	A 2
8D	WARNING LABEL	W S	1	3756-0	HTEL 1	A 2
8E	COVER PLATE	W S	1	4852-0	HTEL 1	A 2
8F	SCREWS	W S	3	3033-0	HTEL 1	A 2
9	FLOW METER	A 2	1	MITE 27 (2700) 0/5 L/MIN	BDIS 1	B 4
10	MOUNTING BRACKET	W S	1	DWG 678/90	IN HOUSE	–
11	BULKHEAD FITTINGS.	W S	3	1/8" FEMALE BHC	PURL 1	D 2
11A	STUD COUPLING (1/8" NPT x 1/4" PIPE)	W S	3	SS 400/1/2	MANC 1	D 4
12	ELBOW COUPLING (1/4" NPT x 1/8" PIPE	W S	2	SS 200/2/4	MANC 1	D 4
13	ELBOW COUPLING (1/8" NPT x 1/8" PIPE)	W S	7	SS 200/2/2	MANC 1	D 4
14	STUD COUPLING (1/8" NPT x 1/8" PIPE)	W S	2	SS 200/1/2	MANC 1	D 4
15	INTERNAL PIPEWORK	W S	1	1/8" O/D SS PIPE	PURL 1	D 2
16	CABLE GLAND (M20)	W S	1	ST816	KLOC 1	A 2
17	CABLE GLAND	W S	2	143-607	FARN 1	B 1
18	COMPONENT MOUNTING SCREWS	W S	1 SET	SEE LIST	HARR 1	D 1
19	TERMINALS LABEL	W S	1	DWG 722/90	IN HOUSE	–
20	SAMPLE INLET LABEL	W S	1	DWG 688/90-3	IN HOUSE	–
21	AUXILIARY INLET LABEL	W S	1	DWG 688/90-4	IN HOUSE	–
22	SAMPLE OUTLET LABEL	W S	1	DWG 688/90-5	IN HOUSE	–
23	VALVE LAGGL	W S	1	DWG 688/90-2	IN HOUSE	–
24	ADHESIVE	W S	1	HYLOGLUE 150	MIDL 1	D 3
25	SURFACE MOUNTING KIT	W S	1	KS 1483	HTEL 1	A 2
26A	SCREWS AND NUTS FOR 26	W S	6	3/16"W x 1" + NUTS + WASHERS	BRAD 7	D 4
26	OPTIONAL PEDISTAL MOUNTING PLATE	W S	1	DWG 683/90	IN HOUSE	–
27	OPTIONAL STAND PIPE MOUNTING BRACKET	W S	1 PAIR	SZ 2584	HTEL 1	A 2

SCREW SET

14 OFF 4BA x 3/8" POZI. PAN. BNP

2 OFF 4BA x 1 1/2" CHEESE HEAD

1 OFF 2BA x 3/8" CHEESE HEAD

2 OFF M5 x 10MM CHEESE HEAD

14 OFF 4BA LOCK WASHERS

3 OFF 2BA LOCK WASHERS.

MODEL SWS-5D -LO PARTS LIST

ISSUE 1	MODS.						
CHECKED							
DATE							

DRAWING No.: 721/98 MSD

ASSOCIATED DRAWINGS:- 720/98 SD

CDS Ltd. L8545

SHAW Moisture Meters Ltd, Westgate, Bradford, BD1 3SQ. England
Tel ++44(0)1274 733582, Fax: ++44(0)1274 370151, e-mail: mail@shawmeters.com

SHAW
Moisture Meters
WESTGATE, BRADFORD, ENGLAND BD1 3SQ
Telephone 0274-733582. Telex 51598. FAX No. 0274-37015

Moisture Meters Ltd, Westgate, Bradford, BD1 3SQ, England
Tel ++44(0)1274 733582, Fax: ++44(0)1274 370151, e-mail: mail@shawmeters.com

HYGROMETRIC EQUIVALENTS

DEWPOINT DEG C	DEWPOINT DEG F	VAPOUR PRESSURE mm Hg *	RELATIVE HUMIDITY % @ 20 C	PARTS PER MILLION by VOLUME	+++	DEWPOINT DEG C	DEWPOINT DEG F	VAPOUR PRESSURE mm Hg *	RELATIVE HUMIDITY % @ 20 C	PARTS PER MILLION by VOLUME
-150	-238	7 x 10(-15)	3.9 X 10(-14)	9.2 x 10(-12)	+++	-52	-62	.02305	.131	30.329
-140	-220	3 x 10(-10)	1.7 X 10(-9)	3.9 x 10(-7)	+++	-50	-58	.02961	.169	38.961
-130	-202	7 x 10(-8)	4.0 X 10(-8)	9.2 x 10(-6)	+++	-48	-54	.03786	.216	49.816
-120	-164	9 x 10(-8)	5.4 x 10(-7)	1.2 x 10(-4)	+++	-46	-51	.04819	.275	63.408
-118	-180	.00000015	.0000009	.00020	+++	-44	-47	.06108	.348	80.368
-116	-177	.00000025	.0000014	.00033	+++	-42	-44	.07709	.440	101.43
-114	-173	.00000041	.0000023	.00054	+++	-40	-40	.09691	.553	127.51
-112	-170	.00000066	.0000038	.00087	+++	-38	-36	.12133	.692	159.64
-110	-166	.00000107	.0000061	.00141	+++	-36	-33	.15133	.863	199.12
-108	-162	.00000169	.0000096	.00222	+++	-34	-29	.1880	1.07	247.37
-106	-159	.00000266	.000015	.00350	+++	-32	-26	.2328	1.33	306.32
-104	-155	.00000413	.000024	.00543	+++	-30	-22	.2871	1.64	377.76
-102	-152	.00000636	.000036	.00837	+++	-28	-18	.3529	2.01	464.34
-100	-148	.00000968	.000055	.0127	+++	-26	-15	.4323	2.47	568.82
-98	-144	.00001459	.000083	.0192	+++	-24	-11	.5277	3.01	694.34
-96	-141	.00002178	.00012	.0287	+++	-22	-8	.6422	3.66	845.00
-94	-137	.00003224	.00018	.0424	+++	-20	-4	.7790	4.44	1025.00
-92	-134	.00004729	.00027	.0622	+++	-18	0	.9421	5.37	1239.61
-90	-130	.00006879	.00039	.0905	+++	-16	+3	1.136	6.48	1494.74
-88	-126	.00009924	.00057	.1305	+++	-14	+7	1.365	7.78	1796.05
-86	-123	.00014205	.00081	.1869	+++	-12	+10	1.636	9.33	2152.63
-84	-119	.0002018	.00115	.2655	+++	-10	+14	1.956	11.15	2573.68
-82	-116	.0002844	.00162	.3742	+++	-8	+18	2.331	13.29	3067.11
-80	-112	.0003981	.00227	.5238	+++	-6	+21	2.771	15.80	3646.05
-78	-108	.0005533	.00316	.7280	+++	-4	+25	3.285	18.73	4322.37
-76	-105	.0007638	.00436	1.005	+++	-2	+28	3.884	22.15	5110.53
-74	-101	.0010476	.00597	1.378	+++	0	+32	4.581	26.12	6027.63
-72	-98	.0014275	.00814	1.878	+++	+2	+36	5.292	30.18	6963.16
-70	-94	.001933	.0110	2.543	+++	+4	+39	6.099	34.78	8025.00
-68	-90	.002603	.0148	3.425	+++	+6	+43	7.012	39.99	9226.32
-66	-87	.003483	.0199	4.583	+++	+8	+46	8.045	45.88	10585.53
-64	-83	.004635	.0264	6.099	+++	+10	+50	9.209	52.52	12117.10
-62	-80	.006135	.0350	8.072	+++	+12	+54	10.518	59.98	13839.47
-60	-76	.008076	.0461	10.626	+++	+14	+57	11.988	68.37	15773.68
-58	-72	.010576	.0603	13.916	+++	+16	+61	13.635	77.76	17940.79
-56	-69	.013780	.0786	18.132	+++	+18	+64	15.478	88.27	20365.79
-54	-65	.01787	.1019	23.513	+++	+20	+68	17.535	100.00	23072.37

* Courtesy of the American Institute of Physics Handbook, Third Edition, published by McGraw-Hill book company.

Relative Humidity and PPM figures are derived from WVP. Figures are in equilibrium with water above, and ice below, 0 C.

WATER VAPOUR PRESSURE is the pressure exerted by the water vapour content of a gas. The total pressure exerted by the gas mixture is equal to the sum of the pressures exerted by its components - including water vapour. Water vapour pressure varies in direct proportion to the total gas pressure.
DEWPOINT TEMPERATURE is the temperature to which the gas must be cooled in order that it should be saturated with water vapour (100% relative humidity). Dewpoint temperature varies in direct proportion to the total gas pressure.
PARTS PER MILLION by VOLUME is the ratio of the water vapour pressure to the total gas pressure. It is not affected by variations in the total pressure, as the ratio remains the same.
RELATIVE HUMIDITY is the ratio of the water vapour pressure to the saturation water vapour pressure at the same temperature and total pressure. It varies in direct proportion to the total pressure.

Phone 0274 733582 Telex 51598 SHAW G Fax 0274 370151