

Model DS1000 Dewpoint Meter



Instruction Manual

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Model DS1000 - ADHS System



Installation, Commissioning and Operation Manual

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1 General Specification

1.1 Instrument

Model	:	DS1000
Cabinet	:	Panel Mounting with IP65 Front Panel
Material	:	ABS/PC
Flammability	:	IEC 707 FVO
Panel Cut Out	:	92 x 45
Display	:	4 digit bright LED
Resolution	:	Dewpoint 0.1°C (0.1°F) ppm _v 0.1
Alarms	:	2 changeover alarm relays, normally energised, with separately adjustable set points. Relay contact rating 7A @ 250V AC Trip on rising dewpoints.
Output	:	4/20mA DC linear over specified range Maximum Load 1K (active) [(V supply -2)/20]KΩ (passive).
Supply	:	90 to 250V AC @ 50/60Hz

1.2 Sensor

Model	:	ADHS/1000
Enclosure	:	Stainless Steel with IP65 weatherproof seals
Range	:	see sensor label
Accuracy	:	Dewpoint ±2°C (±4°F) ppm _v ±2°C dewpoint equivalent (Refer to calibration certificate for further information). calibration traceable to National & International Standards
Pressure	:	50 barg maximum (standard version)
Connector	:	8 pin connector (IP65 when mated)
Cable	:	4 wire (shielded) maximum cable length 100m.

1.3 Sensor Holder

Model	:	ADHS
Material	:	Stainless Steel
Connections	:	Stainless Steel Swagelok tube fittings
Mounting	:	2 x M5 tapped holes in base OR 4 holes 5mm dia. @ 42 x 35 centres, in mounting bracket.

1.4 System

Operating Temperature	:	-10 to +50°C (+14 to +122°F)	
Operating Humidity	:	10 to 90% RH (non-condensing)	
Storage Temperature	:	-50 to +70°C (-58 to +158°F)	
Electromagnetic Compatibility:	Immunity	:	BS EN 61000-6-1:2001
	Emissions	:	BS EN 61000-6-3:2001

2 Safety Information

Read the safety information below, **before installation**.

3 Warning

Hazardous voltages may be present on the instrument terminals. The equipment must be installed by suitably qualified personnel and the instrument mounted in a position which provides protection, behind the panel, to at least IP20.

4 Isolation

The power supply terminals and associated internal circuitry are isolated from all other parts of the equipment in accordance with EN61010-1:2001 for connection to a category II supply (pollution degree 2).

Function isolation (500V max.) is provided between input and output circuits.

Any terminals or wiring connected to the input or output, which are accessible in normal operation, must only be connected to signals complying with the requirements for Safety Extra Low Voltage (SELV) circuits.

The mains supply to the instrument must be protected by an external 1-amp fuse and a suitable switch or circuit breaker that should be near the instrument.

NOTE: The instrument contains no user serviceable parts.

5 Installation

5.1 Installing the Instrument into a Panel

Make a cut-out in the donor panel 92.0/92.8 x 45.0/45.6mm (DIN 43700).

The maximum panel thickness is 10mm and, if an effective IP65 weatherproof seal is required, the minimum recommended panel thickness is 1.6mm.

Pass the instrument cabinet through the cutout in the donor panel and slide the panel clamp over the instrument, from the back, ensuring that the narrow section is at the top.

Screw the panel clamp retaining screws into the instrument cabinet until the instrument is clamped in position. The screws must be tightened sufficiently to create a seal between the front of the donor panel and the back of the instrument bezel, but never over tightened to the point of fracturing the panel clamp or instrument case.

5.2 Free Standing cabinet

(If Applicable)

Remove the 4 screws at the sides of the cabinet and remove the cover.

Remove the plug-in connectors from the back of the instrument. Pass the instrument through the cut-out in the front of the cabinet chassis and slide the panel clamp, from inside the chassis, over the back of the instrument, ensuring that the narrow section is at the top.

Ensure that the connector sockets at the back of the instrument are correctly located in the cut-outs provided.

Enter a No. 2 pozidriver through the 2 round holes at the back of the chassis and screw the panel clamp retaining screws until the instrument is firmly clamped in position in the chassis.

Refit the cabinet cover, replace the retaining screws and refit the plug-in connectors.

NOTE: The plugs in cable connectors are NOT interchangeable; therefore ensure that the three 5 pin connectors are kept in the appropriate slots.

5.3 Instrument Wiring

Please refer to the electrical connections diagram on page 9.

5.4 Power Supply

Connect the power supply cable to the orange coloured terminal block and observe polarity.

The power supply should be between 90 and 250V AC @ 50/60Hz.

NOTE: All wires are retained by screws. Ensure that the exposed section of the wire is fully inserted and that no loose strands are exposed.

5.5 Sensor, Alarm and Output Cable Connectors:-

To open the spring clamp terminals, EITHER:-

- a) Insert a flat bladed screwdriver into the rectangular slot, above the cable entry and twist it through 90°. This forces the cage open and the cable can be inserted through the round hole.

Twist the screwdriver back through 90° and extract it from the rectangular slot, to clamp the cable.

OR

- b) Only if the cable connector has been unplugged from the instrument, lay the connector on a flat surface and push down on the upper section of the spring

clamp that is visible through the slot in the top of the connector. This forces the cage open and the cable can be inserted through the round hole.

Remove the downward pressure on the spring clamp to clamp the cable.

5.6 Sensor Cable

Connect the sensor cable to the lower left 5 pin connector, ensuring that the correct colour coding is observed and that the cage is securely clamped onto the bootlace ferrules on the cable provided.

Route the sensor cable to the intended site of the sensor.

NOTE: Do not install the sensor at this time. Wait until the commissioning stage, as described on page 6.

5.7 Alarm Cable

Make the appropriate connections, noting the normally open and normally closed relay contact positions.

5.8 Analogue Output Cable

Make the appropriate connections, ensuring that the correct polarity and the maximum load specification is strictly observed.

As can be seen from the label, the output can be used in either ACTIVE or PASSIVE mode and it is important that the correct option is used, to ensure normal operation of the output system.

6 Installing the Air/Gas Sampling System

The piping installation schematic diagram on page 5 of this manual, shows all components which could be used in a dry gas measurement application although all the items shown will not be required for every installation.

Care should be taken to ensure that the sample presented to the measuring sensor is not contaminated with any component that will damage, contaminate or affect the sensor in a way that will impair the system accuracy.

It is strongly recommended that the sample should not contain particulate matter, oil or other heavy hydrocarbon condensate. If these components contaminate the sample system and/or the measuring sensor the system response time will be lengthened, although the sensor calibration will not be effected.

The sample must not contain Ammonia, Chlorine, Ozone or any wet acid vapours or liquid as these will permanently damage the sensor and impair calibration accuracy.

The flow rate, although not critical to the sensor measurement, should be low enough to avoid abrasion to the sensor surface without being so low as to extend the system

response time to an unacceptable level. In general, a flow rate of between 2 and 3 litres/min at NTP will give the right balance.

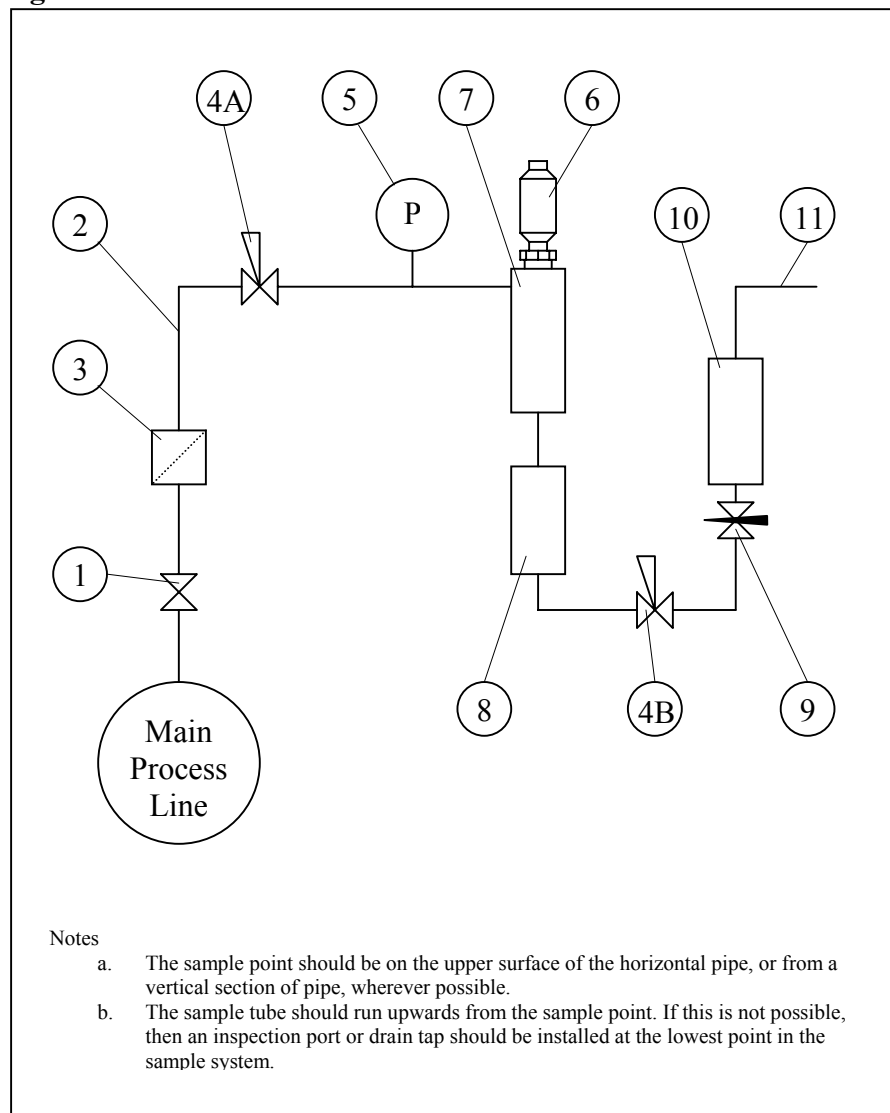
The sensor is a variable capacitor which is directly affected by changes in partial pressure of water vapour and these changes, which are proportional to the dew/frost point temperature, are displayed on the instrument indicator.

Partial pressure of water vapour is directly affected by total pressure and, this being the case, the instrument will display the dew/frost point temperature at whatever total pressure the sensor is exposed, therefore care should be taken to ensure that the sample pressure, at the sensor is that at which the dew/frost point readings are required.

The measuring sensor can be installed directly into the process line but this does create problems with access for maintenance and calibration. It is for these reasons that we recommend that the sensor be installed in a bypass, fast loop or total loss sample system where the sensor is accessible without interrupting the main process flow line.

NOTE Do not install the sensor at this time. Wait until the commissioning stage, as described on page 6.

6.1 Piping Installation



6.2 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 within minimum flow. 6mm OD (1/4”) tube can be used where pressure drops across the 3mm tube are too high
3. Filter Unit – A filter unit is recommended when the samples are likely to contain particulate matter. If the air/gas sample contains heavy hydrocarbon condensate, the filter must be of the coalescing type with a drain. The filter unit should be positioned as close to the sample point as practical.
4. Pressure Reduction Valve or Pressure Regulator – If the sample is to be measured at atmospheric pressure then the valve 4A should be fitted and 4B omitted from the system. If the sample is to be measured, at full line pressure 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 a vent, which is at a pressure higher than atmospheric, and the input to that line needs a controlled pressure then both 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 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 the 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 to 3 SL/M.
11. Sample Exhaust – The exhaust can be vented to atmosphere or returned to the process line as discussed above.

7 Commissioning

Switch the instrument power ON. The display will read “ ____ ”. This is the 'Sensor Disconnected' display condition.

7.1 Setting the Alarm Trip Points

The alarm trip points are factory set to full scale for instrument test purposes only.

To adjust the alarm set points, use the following procedure:-

1. Press the left hand side button on the front panel keypad.
The display will indicate SET 1
2. Press the middle button and the display will indicate the full scale value of the sensor range, with the first digit flashing.

NOTES

- a) The flashing digit of the display is the one that can be adjusted.
- b) Pressing the middle button moves the flashing digit along the display
- c) Pressing the right hand side button adjusts the digit value.

3. Adjust the display until the required trip point for Alarm 1 is indicated.
4. Press both the middle and right hand side buttons together. This sets the trip point for Alarm 1 into the instrument memory.
The display will indicate SEt 2
5. Press the middle button and the display will indicate the full scale value of the sensor range, with the first digit flashing.
6. Adjust the display, as with Alarm 1, until the required trip point for alarm 2 is indicated.
7. Press the middle and right hand side buttons together. This sets the trip point for Alarm 2 into the instrument memory. The display will now read SEt 1
8. Press the left hand side and middle buttons together.
The display will revert to the 'Sensor Disconnected' display condition.
9. To confirm the correct settings or to view the settings at any time:-
 - (i) Press the left hand button, the display will indicate SEt1.
 - (ii) Press the middle button, the display will indicate Alarm 1 set point.
 - (iii) If this is OK, press the middle and right hand side buttons together and the display will indicate SEt2.
 - (iv) Press the middle button, the display will indicate Alarm 2 set point.
 - (v) If this is OK, press the middle and right hand side buttons together and the display will indicate SEt1.
 - (vi) Press the left hand side and middle buttons together to return to the dewpoint display.
10. If the alarm set points have to be altered, at any time, repeat steps 1 to 8.

8 Installing and Commissioning Sensor

It is advisable to carry out an initial purge routine of the sample loop, before installing the sensor, in order to remove the possibility of sensor damage on start-up.

Refer to the sample system schematic on page 5 of this manual and open the inlet isolation valve slowly, until a small flow of air/gas at atmospheric pressure flows

through the inlet pipework to the sensor holder and exhausts through the sensor entry port of the sensor holder.

Allow this purge to continue for about 15 to 20 minutes to remove any residual moisture from the sample pipework and components.

Close the inlet isolation valve, install the sensor into the sensor holder and ensure that the 8 pin sensor cable connector is correctly positioned and the locking ring screwed down securely to effect a weatherproof seal.

NOTE: The Plug and socket of the connector have location keys to ensure correct positioning. Care should be taken to ensure that correct alignment is made before attempting to mate the plug and socket or damage to the connector pins will occur, resulting in malfunction of the instrument.

Open the inlet valve slowly, again and, by opening all valves after the sensor holder, allow a low pressure purge through the whole sample system. (Note. If a closed by-pass loop is installed, this section of the procedure is not possible).

Set the required pressures and flows within the sample loop.

This completes the installation and commissioning but, on initial start-up, it could take several hours for the system to reach equilibrium.

The instrument will now indicate the dewpoint of air/gas surrounding the sensor, at sensor pressure and the analogue output will be giving a mA signal proportional to the indicated dewpoint or ppm_v.

9 Operation

The system is designed to operate continuously, with a minimum amount of operator input.

It is, however, advisable to inspect the sample loop periodically to ensure that the required pressures and flows are being maintained.

While the sensor should give several years operation, it is advisable to have the calibration verified, from time to time, to ensure accurate operation of the system. Please refer to your local dealer for recalibration information.

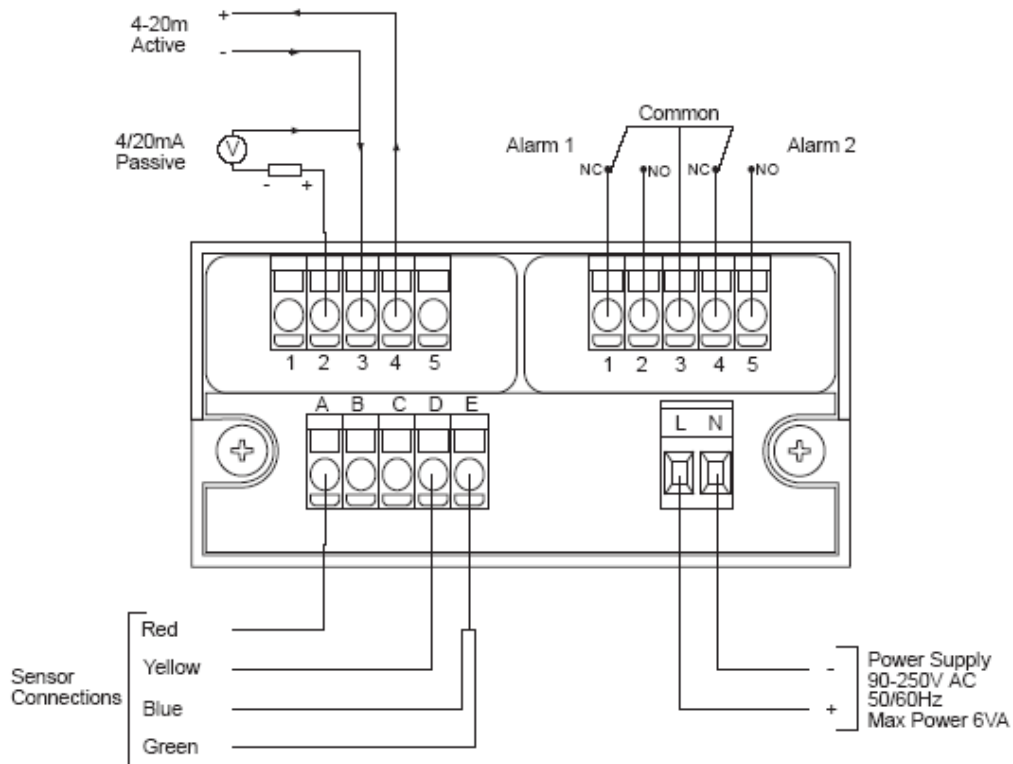
The number and type of items employed in the sample loop will determine what, if any, other routine checks should be made. If, for instance, a filter is used, the filter element should be inspected periodically and changed when necessary.

The instrument should not require any routine maintenance but if any malfunction is suspected it is advisable to contact your local dealer.

Should it be necessary, at any time or for whatever reason, to change either the instrument or sensor, it should be noted that the components of the DS1000 system are fully and completely interchangeable provided that the corresponding

instrument/sensor range is requested. The only adjustment necessary would be the alarm set points in the case of the instrument.

10 DS1000 - ADHS Electrical Connections



11 Peak/Valley Display

The maximum and minimum process variables measured since switch-on or last reset are continuously calculated within the instrument. To view peak, press the center button, to view valley press the right-hand button. Pressing the Left-hand button will reset the peak and valley values.

12 Failure Modes

Display	Fault	Action
“ - - - - “	Over Range – input to DS1000 greater than 20mA	Measure the mA in the Yellow wire using a DVM. 20.5mA = Sensor Open Circuit 21.0mA = Sensor Short Circuit
“ - - - - “	Under Range – input to DS1000 less than 4 mA	Measure the mA in the Yellow wire using a DVM. Approx 4mA = Moisture level below range of ADHS Sensor. 0mA = Fault with ADHS Sensor output or cable.

13 Hygrometric Equivalents

DEWPOINT °C	DEWPOINT °F	VAPOUR PRESSURE mmHg	PARTS PER MILLION by VOLUME	DEWPOINT °C	DEWPOINT °F	VAPOUR PRESSURE mmHg	PARTS PER MILLION by VOLUME
-150	-238	7x10(-15)	9.2x10(-12)	-52	-62	0.02305	30.329
-140	-220	3x10(-10)	3.9x10(-7)	-50	-58	0.02961	38.961
-130	-202	7x10(-9)	9.2x10(-6)	-48	-54	0.03786	49.816
-120	-184	9x10(-8)	1.2x10(-4)	-46	-51	0.04819	63.408
-118	-180	0.00000015	0.00020	-44	-47	0.06108	80.368
-116	-177	0.00000025	0.00033	-42	-44	0.07709	101.43
-114	-173	0.00000041	0.00054	-40	-40	0.09691	127.51
-112	-170	0.00000066	0.00087	-38	-36	0.12133	159.64
-110	-166	0.00000107	0.00141	-36	-33	0.15133	199.12
-108	-162	0.00000169	0.00222	-34	-29	0.1880	247.37
-106	-159	0.00000266	0.00350	-32	-26	0.2328	306.32
-104	-155	0.00000413	0.00543	-30	-22	0.2871	377.76
-102	-152	0.00000636	0.00837	-28	-18	0.3529	464.34
-100	-148	0.00000968	0.0127	-26	-15	0.4323	568.82
-98	-144	0.00001459	0.0192	-24	-11	0.5277	694.34
-96	-141	0.00002178	0.0287	-22	-8	0.6422	845.00
-94	-137	0.00003224	0.0424	-20	-4	0.7790	1025.00
-92	-134	0.00004729	0.0622	-18	0	0.9421	1239.61
-90	-130	0.00006879	0.0905	-16	3	1.136	1494.74
-88	-126	0.00009924	0.1305	-14	7	1.365	1796.05
-86	-123	0.00014205	0.1869	-12	10	1.636	2152.63
-84	-119	0.0002018	0.2655	-10	14	1.956	2573.68
-82	-116	0.0002844	0.3742	-8	18	2.331	3067.11
-80	-112	0.0003981	0.5238	-6	21	2.771	3646.05
-78	-108	0.0005533	0.728	-4	25	3.285	4322.37
-76	-105	0.0007638	1.005	-2	28	3.884	5110.53
-74	-101	0.0010476	1.378	0	32	4.581	6027.63
-72	-98	0.0014275	1.878	2	36	5.292	6963.16
-70	-94	0.001933	2.543	4	39	6.099	8025.00
-68	-90	0.002603	3.425	6	43	7.012	9226.32
-66	-87	0.003483	4.583	8	46	8.045	10585.53
-64	-83	0.004635	6.099	10	50	9.209	12117.10
-62	-80	0.006135	8.072	12	54	10.518	13839.47
-60	-76	0.008076	10.626	14	57	11.988	15733.68
-58	-72	0.010576	13.916	16	61	13.635	17940.79
-56	-69	0.01378	18.132	18	64	15.478	20365.79
-54	-65	0.01787	23.513	20	68	17.535	23072.37

14 Appendix A - Installing a Panel Mounted Weatherproof Enclosure

1. Machine the panel cut-out $139 \pm 0.5\text{mm}$ wide x $68.5 \pm 0.2\text{mm}$ high.
2. Remove the retaining screw clips, from the sides of the cabinet and position the cabinet through the donor panel.
3. Re-fit the retaining clips and screw the retaining screw into position to secure the instrument into the panel.

14.1 Wiring Access

1. Open the display door.
2. Unscrew the 4 panel retaining screws, on the front panel, and withdraw the panel and instrument from the enclosure.
3. Feed the power, sensor and signal wires through the cable glands in the rear panel of the enclosure.
4. Make all connections required, as detailed in the user manual.
5. Re-position the instrument and panel into the enclosure, feeding the excess cable back through the cable glands as necessary and re-fit the 4 panel retaining screws.

NOTE: Refer to the user manual for all operational details.