DS1200-AMT Dewpoint Hygrometer

Installation, Commissioning and Operation Manual

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DS1200 Dewpoint Analyser

Instruction Manual

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1551 DS1200 - AMT User Manual

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1 Safety Instructions

Warning!

- This DS1200 is designed for connection to hazardous electric voltages. Ignoring this warning can result in severe personal injury or mechanical damage. To avoid the risk of electric shock and fire, the safety instructions of this manual must be observed and the guidelines followed. The specifications must not be exceeded, and the DS1200 must only be applied as described in the following pages. Prior to the commissioning of the DS1200, this manual must be examined carefully. Only qualified personnel (technicians) should install this DS1200.
- If the DS1200 is used in a manor not specified by the manufacturer, the protection provided by the equipment may be impaired.

Warning!

- Until the DS1200 is installed, do not connect hazardous voltages to the DS1200.
- Trouble shooting of the DS1200-AMT System should only be carried out on a disconnected DS1200-AMT and under ESD safe conditions.
- Repair of the DS1200 must be done by Alpha Moisture Systems, or authorised distributors, only.

1.1 Definitions:

- Hazardous voltages have been defined as the ranges: 75 to 1500 volt DC, and 50 to 1000v volt AC.
- Technicians are qualified persons educated or trained to mount, operate, troubleshoot and technically correct, in accordance with safety regulations.
- Operators are persons, being familiar with the content of this manual, able to adjust and operate the DS1200 during normal operation.

1.2 Receipt and Unpacking:

- Unpack the DS1200 without damaging it and make sure that the manual always follows the DS1200 and is always available. The packing should always follow the DS1200 until this has been permanently mounted
- Check at the receipt of the DS1200 whether the type corresponds to the one ordered.

1.3 Environment:

- Avoid direct sunlight, dust, high temperatures, mechanical vibrations and shock, as well as rain and heavy moisture. If avoidance of high moisture is not possible, employ ventilation, rather than increased temperature, to prevent condensation.
- The DS1200 falls under the installation Category II, pollution Degree 1, and Insulation Class II.

1.4 Normal Operation:

- Operators are only allowed to adjust and operate the DS1200 when safely fixed to a panel, thus avoiding the danger of personnel injury and damage. This means there is no electrical shock hazard, and the DS1200 front panel is easily accessible.

1.5 Cleaning:

- When disconnected, the DS1200 may be cleaned with a cloth moistened with distilled water or ethyl alcohol.

2 DS1200/AMT System Description

- DS1200 has a 4-digit 14 segment LED display
- Loop powered Model AMT transmitter DS1200 Input (terminals 45 & 46)
- DS1200 has 2 Alarm Relays (terminals 21 to 26)
- DS1200 has mA Output (terminals 11 and 12)
- Universal Voltage Supply (terminals 31 & 32)

2.1 DS1200/AMT System Application:

- The DS1200 displays a digital readout of moisture content, derived from the model AMT.
- Process control with 2 adjustable Alarm set points and an analogue output.

2.2 DS1200 Technical Characteristics:

- 4-digit LED indicator with 13.8mm, 14 segment, characters, programmed to the range of the model AMT and relay ON/OFF indication.
- Alarm set points can be adjusted to any application by use of the front keys.

3 DS1200 Mounting:

- Only technicians who are familiar with the technical terms, warnings, and instructions in the manual and who are able to follow these should connect the DS1200.
- Should there be any doubt as to the correct handling of the DS1200, please contact your local distributor.
- Mounting and connection of the DS1200 should comply with the national legislation for the mounting of electric materials, i.e. wire cross-section, protective fuse, and location. Descriptions of Input / Output and supply connections are shown in the block diagram on page 5 and the instrument top label.
- The maximum size of the protective fuse is 10A and, together with the power switch, it should be easily accessible and close to the DS1200. The power switch should be marked with a label indicating it will turn OFF the voltage to the DS1200
- To be mounted in front panels. The included rubber packing must be mounted between the panel cutout and the display front to obtain IP65 (NEMA 4) ingress protection.

3.1 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 cut-out in the donor panel and slide the panel clamp over the instrument, from the back.
- Turn the Red panel clamp screws until the instrument is clamped in position. The screws must be tightened sufficiently to affect 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.

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

4 Wiring

4.1 DS1200 Power Supply

- Connect the power supply cable to the green 2 terminal block marked 31 and 32 no polarity.
- The power supply should be 22 to 253 VAC @ 50/60Hz or 20 to 300 VDC

4.2 AMT Sensor Cable

- Connect the sensor cable to connector slots 45 and 46, ensuring that the red wire connects to pin 46. Observe 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 later

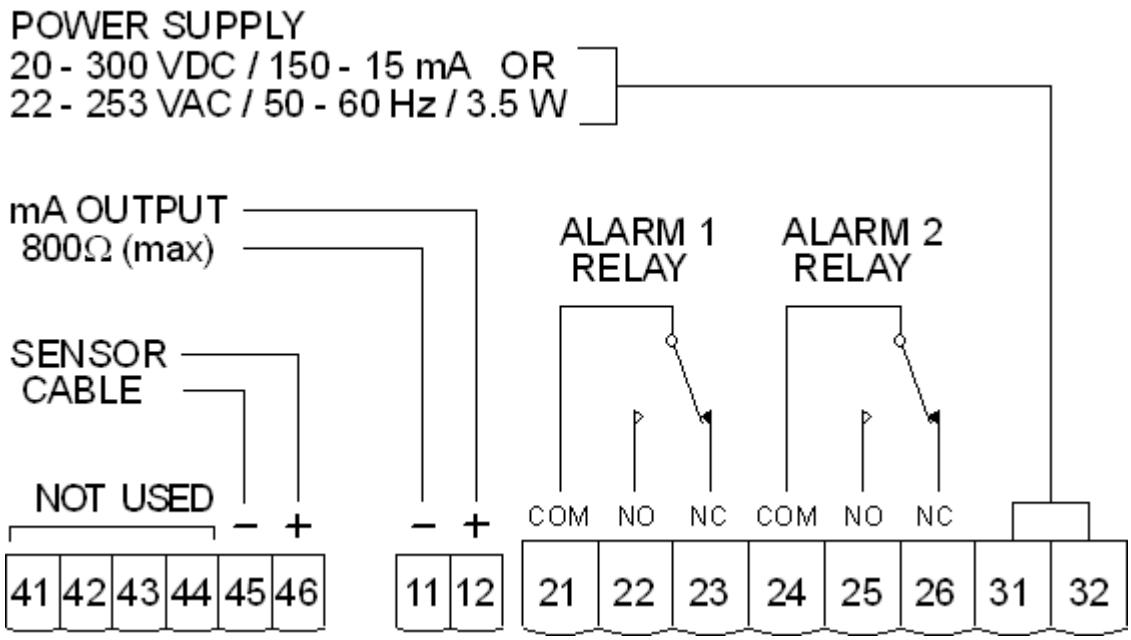
4.3 Alarm Cable

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

4.4 Analogue Output Cable

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

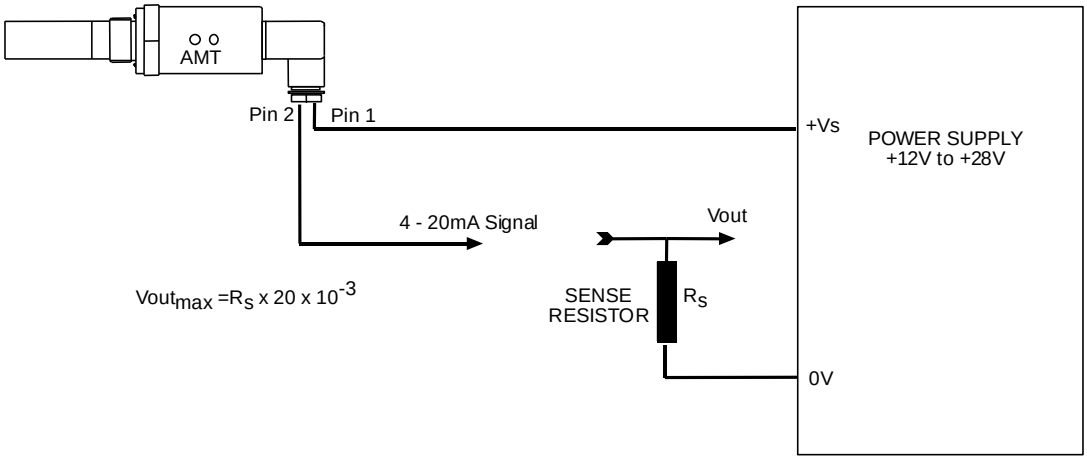
4.5 Rear Connections:



4.6 Wiring the AMT

The AMT is a 2-Wire 4-20mA transmitter.

Typical electrical connection to generate a voltage output is shown below:

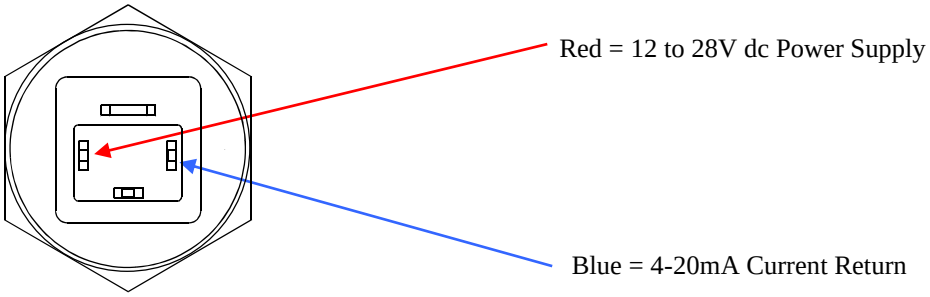


Note, the maximum value for Rs in this circuit can be calculated by the formula:

Rs max = [40 x (Vs – 7)]Ω.

If the wiring resistance is expected to be more than a few percent of the value of Rs, then this resistance must be taken away from the answer to get the maximum usable value of Rs.

4.7 Connector Pins



5 Gas Compatibilities

Corrosive Gases: The Sensor should not be exposed to corrosive gases (or corrosive contaminants in the gas sample) as these can chemically attack the sensor, impairing calibration accuracy and/or damaging it beyond economic repair. Examples of such gases are mercury (Hg), ammonia (NH3), chlorine (Cl2) etc. Strong oxidising agents such as ozone (O3) should also be prevented from coming into contact with the sensor.

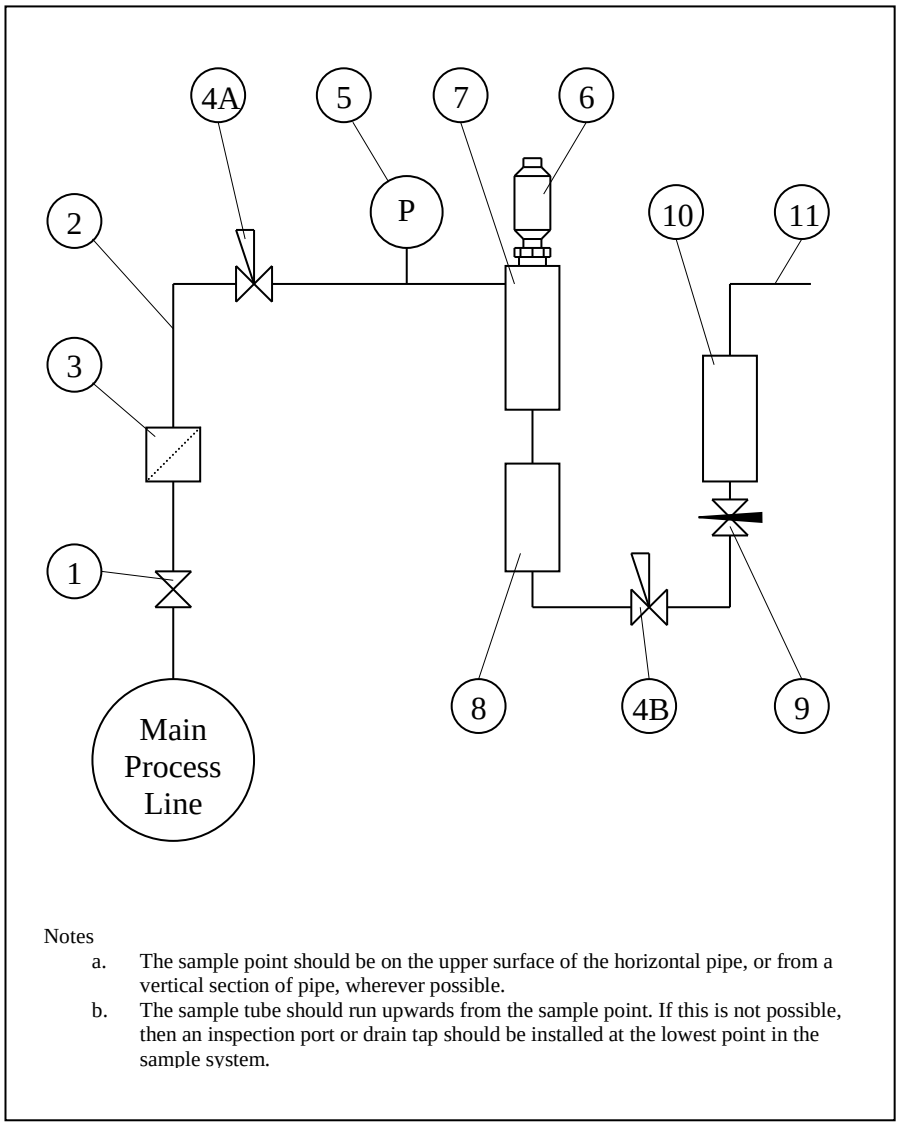
It is strongly recommended that the sample should not contain particulate matter, oil or other heavy hydrocarbon condensate. If these components contaminate the sample system and/or the measuring sensor, the system response time will be lengthened, although the sensor calibration will not be effected.

6 Installing in the Air/Gas Sampling system

- The piping installation schematic diagram below 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.
- 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.

6.1 Piping Installation



Notes

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

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

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 AMT 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.

6.3 Installing and Commissioning the Model AMT Transmitter

- 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 6 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 sensor cable connector is correctly positioned, that the sealing cup is in place and the retaining screw is screwed down securely to affect a weatherproof seal.
- 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, depending on the number and type of components used in the sample loop.
- 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 other engineering units.

6.4 Operation

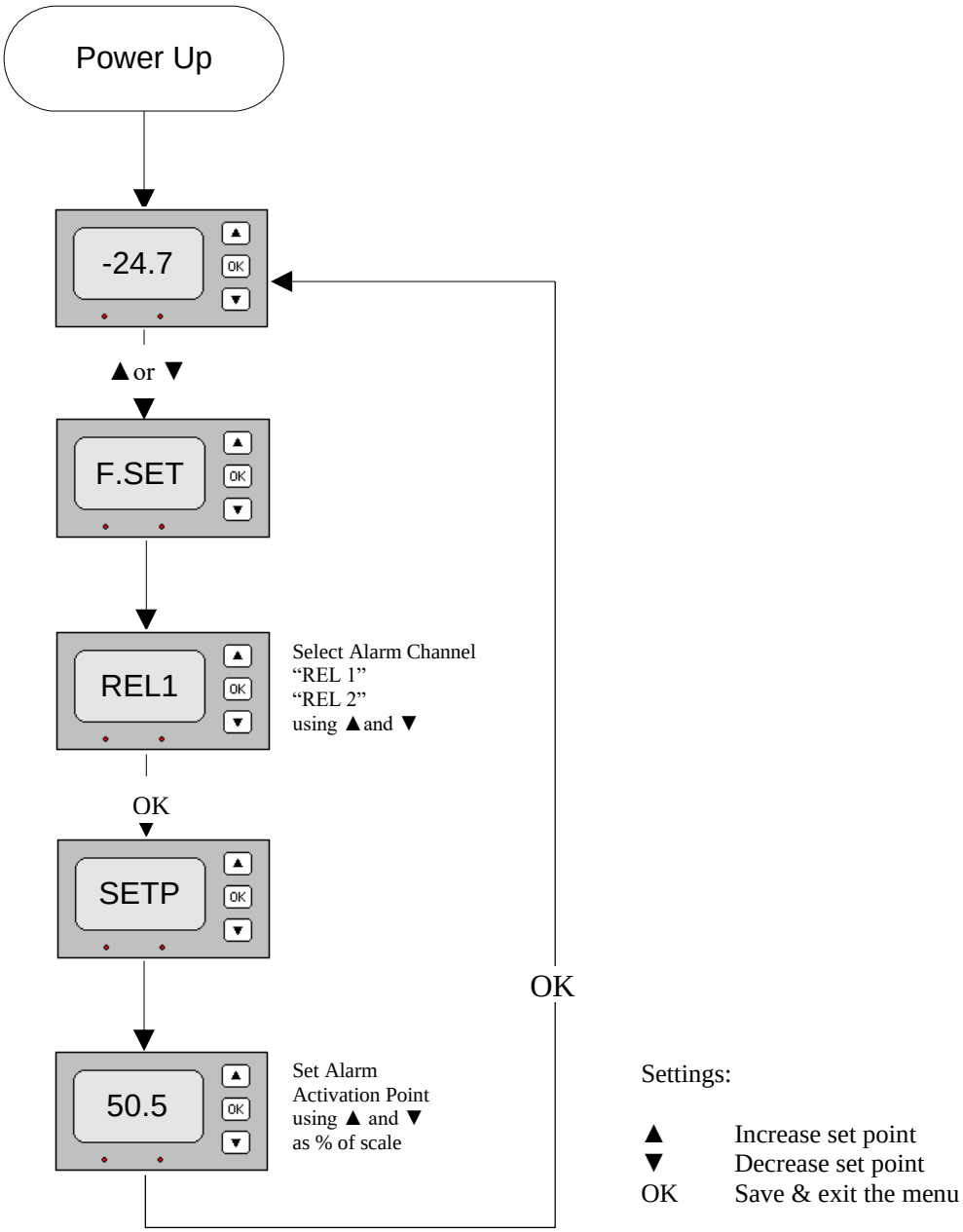
- The system is designed to operate continuously, with a minimum amount of operator input.
- It is, however, advisable to inspect the sample loop periodically to ensure that the required pressures and flows are being maintained.
- The number and type of items employed in the sample loop will determine 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 DS1200 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.
- While the sensor should give several years operation, it is advisable to confirm the calibration, from time to time, to ensure accurate operation of the system.

7 Commissioning

- Switch the instrument power ON. The display will read “SE.BR“. This is the 'Sensor Wire Break' display condition.

7.1 Setting the Alarm Trip Points

- To activate the quick alarm settings screen press either the ”▲” or ”▼” buttons, while the DS1200 is displaying the moisture level. The DS1200 will flash the “F.SET” message followed by a selection menu for Alarm 1 or 2 relay. Scroll to the required alarm and press the “OK” button. The DS1200 then displays the message “SETP” momentarily before displaying the current set point in % of scale.



Note: - that on some Models, the Hysteresis is also settable.

8 Normal Operation

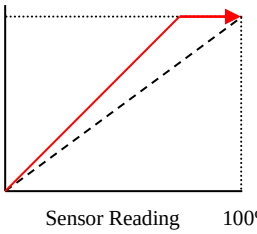
8.1 Analogue 4-20mA Mode (2-wire)

- In normal operation, the transmitter will produce a 4-20mA signal, which is proportional to the level of moisture in the gas being monitored. The moisture reading is sampled and up dated once per second. The AMT has 3020 distinct steps over the 4 to 20mA range corresponding to a resolution of 0.005mA.

9 AMT AutoCal

Warning **Do Not** power down during the AutoCal process as this can lead to corruption of the AMTs memory.

- AutoCal allows the user to ensure accuracy to the laboratory calibration by checking the span of the transmitter and correcting for any deviation. It should be operated periodically, every 2 to 3 months, or when verification of the AMT Transmitter is required.



- The AMT is supplied with an electronic autocal, which allows the calibration span of the transmitter to be adjusted. The autocal is controlled by the 2 buttons located on the side of the AMT transmitter labelled 'W' (wet) and 'D' (dry).

Note : - The AMT must be connected to an indicator or some device able to supply an accurate measurement of the mA output.

9.1 A Pre-conditioning the transmitter

- To perform the autocal, the transmitter needs to be removed from the process gas at which point the display/indicator will read the ambient dewpoint or full scale (if the ambient dewpoint level is above the range of the AMT). Expose the transmitter to the known autocal moisture level and allow the transmitter to attain equilibrium. (For technical questions and advice on the time taken to attain equilibrium Contact your AMT supplier)

Method 1: - Expose to a known moisture level. **(Applicable to all versions of AMT Transmitters)**

If a known gas is available within the range of the transmitter, then the AMT can be AutoCaled against this value.

Method 2: - Saturating method. **(Only applicable to 0ºC (32ºF) and –20ºC (-4ºF) top end range AMT transmitters)**

When the AMT sensing element is exposed to a dewpoint level above the top end range of the transmitter, the sensor will saturate and the transmitter can be AutoCaled to 0°C or –20ºC. For both 0ºC and –20ºC AMTs, ambient dewpoint is usually adequate to saturate the sensor.

Method 3: - Set against Ambient moisture level. **(Only applicable to 20ºC (68ºF) top end range AMT transmitters)**

When the ambient dewpoint is known, then the AMT can be AutoCaled to the ambient value.

9.2 Entering Autocal Mode

- Once the transmitter has been pre-conditioned, the AutoCal Mode of the AMT can be activated. Press and hold the 'W' and 'D' buttons, simultaneously for 5 seconds. **ONLY PRESS THE BUTTONS IF THE SENSOR IS PROPERLY PRE-CONDITIONED. FAILURE TO COMPLY WILL CORRUPT THE TRANSMITTERS CALIBRATION.**

- The attached 4-20mA display will (after the 5 seconds) indicate the bottom range of the AMT (or 4mA if reading current) for 5 seconds, confirming that autocal mode has been entered. The buttons should be released once the display indicates the bottom range.

- After the 5 seconds delay the AMT will revert to the measured dewpoint and the buttons will be active.

9.3 Adjust the autocal

- Use the 'W' and 'D' buttons to move the reading up or down so that the desired dewpoint is displayed.

  Method 1: - Adjust the AMT reading until the indicator reads the known moisture level.

  Method 2: - Adjust the AMT reading until the indicator reads 0°C or –20ºC whichever is applicable to the AMT being AutoCaled

  Method 3:- Adjust the AMT reading until the indicator reads the known ambient moisture reading.

9.4 Completing the autocal

- Once the desired value is reached, the autocal process can be completed simply by leaving the buttons untouched for 30 seconds. After the 30 seconds, the display will indicate the bottom of the range for a period of 5 seconds and then the AMT will exit the autocal mode.

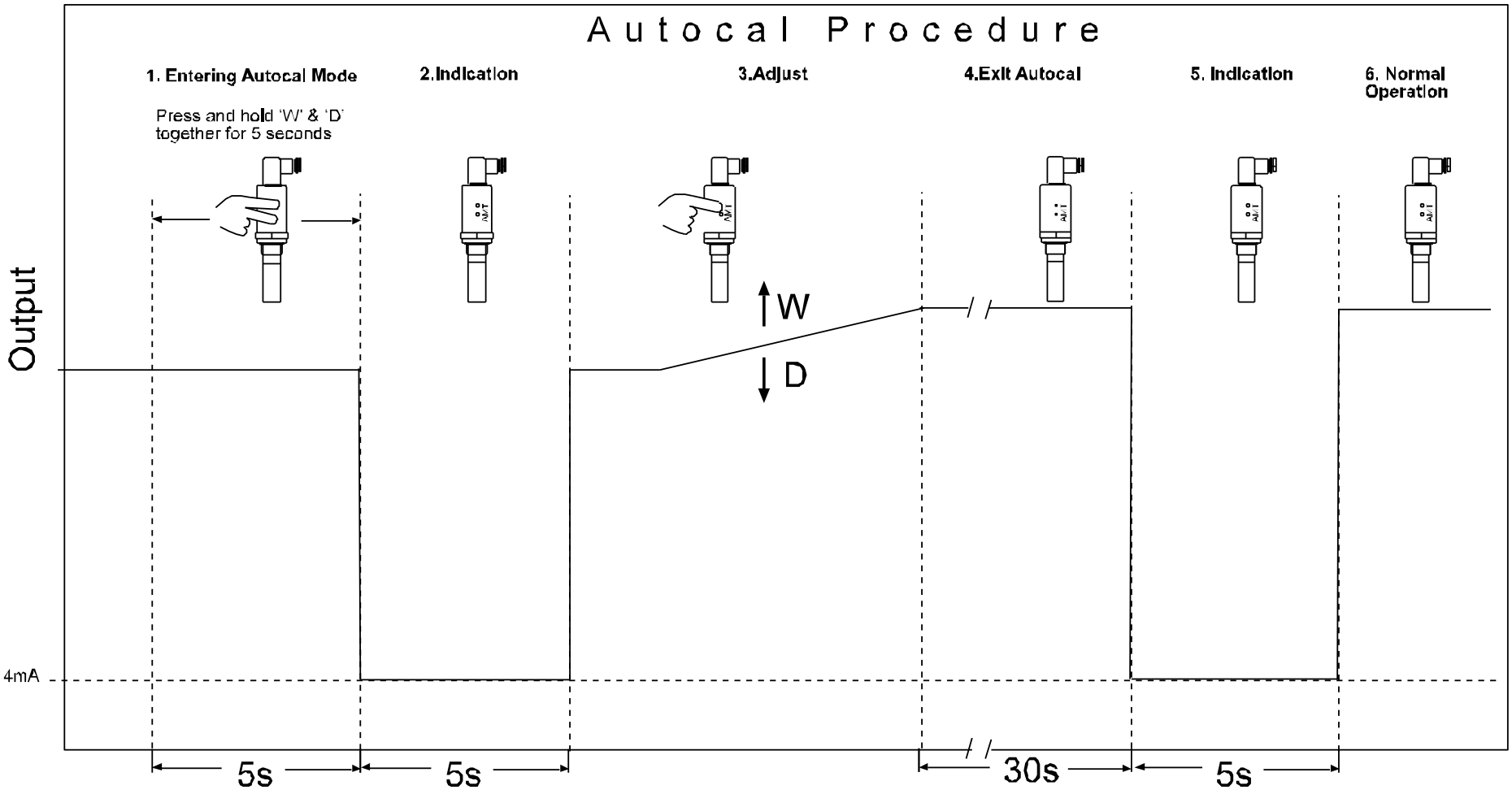
- The AMT will now output the corrected dewpoint and can be reinserted into the process.

- A graphical description of the autocal modes is given on the next page.

9.5 AMT Range AutoCal Method Lookup Table

Use the table below to decide which AutoCal methods are appropriate for your AMT.

Range			Methods Appropriate
-80 to –20ºC	-112ºF to –4ºF		1 & 2
-110 to –20ºC	-166ºF to –4ºF		1 & 2
-120 to –20ºC	-184ºF to –4ºF		1 & 2
-65 to 0ºC	-85ºF to 32ºF		1 & 2
-80 to 0ºC	-112ºF to 32ºF		1 & 2
-100 to 0ºC	-148ºF to 32ºF		1 & 2
-65 to 20ºC	-85ºF to 68ºF		1 & 3
-100 to 20ºC	-148ºF to 68ºF		1 & 3
-120 to 20ºC	-184ºF to 68ºF		1 & 3
1-1000ppm(v)	0.1-100ppm(v)	0.01-10ppm(v)	1
1-1000ppb(v)			1
0.01-10g/m3	0.001to1g/m3		1
0.1-10lb/MMSCF	0.1-25lb/MMSCF	0.1-50lb/MMSCF	1


Autocal Procedure
1. Entering Autocal Mode
Press and hold 'W' & 'D' together for 5 seconds
2.Indication
3.Adjust
4.Exit Autocal
5. Indication
6. Normal Operation
Output
W
D
4mA
5s
5s
30s
5s

10 Faults/Errors

- If the sensor is short-circuited, the transmitter will produce a constant 20.75mA output.
- If the sensor is open-circuited, the transmitter will produce a constant 20.50mA output.

11 Specifications

11.1 DS1200 Specifications:

- Temperature operating range = -20ºC to +60ºC
- Power supply = 20 – 300 VDC, or 22 to 253 VAC 50 – 60 Hz
- 3.2W internal power consumption
- 3.5W maximum power consumption
- Isolation voltage test / operation = 2.3KVAC / 250 VAC
- Signal to noise ratio = Min 60dB (0-100kHz)
- Display Response time (0-90%, 100 to 10%) = 0.4s.
- Wire size, pin 45 & 46 (max) = 1 x 1.5mm^2 stranded wire
- Wire size, others (max) = 1 x 2.5mm^2 stranded wire
- Relative Humidity = < 95% RH
- Dimensions (HxWxD) = 48 x 96 x 120mm
- Cut out dimensions = 44.5 x 91.5mm
- Ingress Protection = (Front panel) IP65
- Weight = 230g
- Input
    - From model AMT
    - Error detection = Cable loop break
- Display
    - Display Readout = AMT range
    - Scrolled error display
- Current Output
    - Programmable signal ranges = 0…20 or 4…20mADC (Factory set)
    - Load (max) 20mA / 800Ω / 16VDC
    - Load stability ≤ 0.01 % of span / 100 Ω
- Relay
    - Relay function = setpoint
    - Hysterisis 1% of range
    - Max voltage = 250 VRMS
    - Max Current = 2A /AC
    - Max AC power = 500VA
    - Max current at 24 VDC = 1A

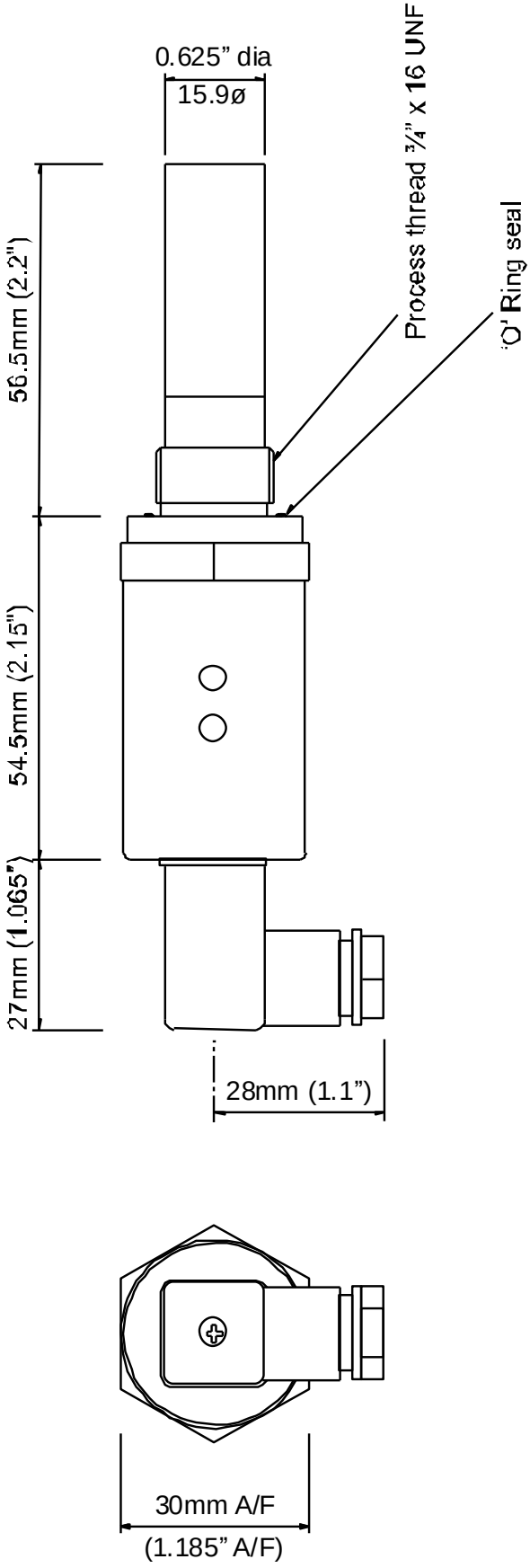
11.2 AMT Specification

Display	:	Compatible with the 4-20mA DS1200 Dewpoint Meter.
Output Signal	:	4 to 20mA Linear
Operating Voltage	:	7V - 28V DC. Reverse polarity protected.
Maximum Series Resistance:		= {40 x (Supply Voltage – 7)}Ω
Sensing element	:	Ultra High Capacitance - Aluminium Oxide Type
AutoCal	:	Field calibration / Span check facility.
Factory calibration	:	Supplied with Certificate of Calibration traceable to NPL / NIST
Accuracy	:	± 2°C dewpoint (NPL / NIST traceable for range -90°C to 20°C)
Temperature compensation:		Temperature compensated for operating range.
Resolution	:	5 µA
Repeatability	:	Better than ±0.3ºC dewpoint
Operating temperature	:	-20°C to +60°C
Storage Temperature	:	-20°C to +70°C
Operating Pressure	:	From 1kPa (0.01 barA) to Maximum 35,000kPa (350 barA)
Operating Humidity (External):		Maximum - 95% RH Non-condensing
Sample Flow Rate	:	Independent but ideally 2 to 5 litres per minute. Max: 25 litres/min.
Cable Terminations	:	IP66 (NEMA4X) rated, size C, DIN EN 175301 connector at the transmitter and other end terminated with bootlace ferrules.
Cable	:	Supplied with 2m standard cable. Nominal diameter 3.4mm, 92ohms/km.
Electromagnetic Compatibility (EMC):		BS EN 61326-1
Warm Up Time	:	10 seconds
Fault Conditions	:	Sensor Open Circuit : Output drives to 20.50mA Sensor Short Circuit : Output drives to 20.75mA
Isolation	:	Sensing Element connected to the 4-20mA loop but isolated from body.
Transmitter Enclosure	:	316 Stainless steel body with size C, DIN EN 175301 connector.
Sensor Protection	:	316 Sintered stainless steel filter - 50 micron
Probe Material (Wetted Parts):		316 Stainless Steel
Weatherproof Classification:		IP66 / NEMA4X when Connector mated to Transmitter.
Mechnical Connection	:	3/4" UNF (16tpi) with integral Viton "O" ring seal.
Mechanical Warranty	:	12 months in case of faulty workmanship and defective parts.
Calibration Warranty	:	12 months subject to usage.
Weight	:	175grams (includes connector)

11.3 Applicable Standards

- EMC = EN 61326
- Low voltage = EN 61010-1
- Standard for Safety = UL 508

Appendix A – AMT with Connector, General Arrangement



Appendix B – Sensor Holder General Arrangement