SMS Optidew

High Performance Optical Dew-Point Transmitter

Users Guide

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1 Product Overview

SMS Optidew is a High Performance Optical Dew-point Transmitter working on a proven, fundamental optical dew-point measurement principle, giving unmatched and drift-free long-term performance. It offers a wide measurement range from -60 to +90 °C dew point (or 0.5 to 100 % rh) at temperatures from -40 to +90 °C. Provided are two linear 4-20 mA outputs in addition to serial communications, allowing set-up and monitoring by a suitable computer or PLC system or via specific application software. An adjustable volt-free contact alarm means that Optidew can be used for direct process control.

Class leading depression coupled with cable length capability of up to 250 metres and a pressure rating up to 25 MPa, makes almost any industrial application possible. The sensor is completely sealed to prevent contamination or corrosion of optical components. The two stage sensor has a depression of 66 °C, giving an equivalent % rh measurement range of 0.5 % to 100 %.

2 Installation

Simply connect the instrument, power up and SMS Optidew is ready to operate. The sensor is designed to work hard - with a corrosion-resistant gold plated mirror and solid construction.

All of the connections to the SMS Optidew are made directly to the processor p.c.b. as specified on the following page.

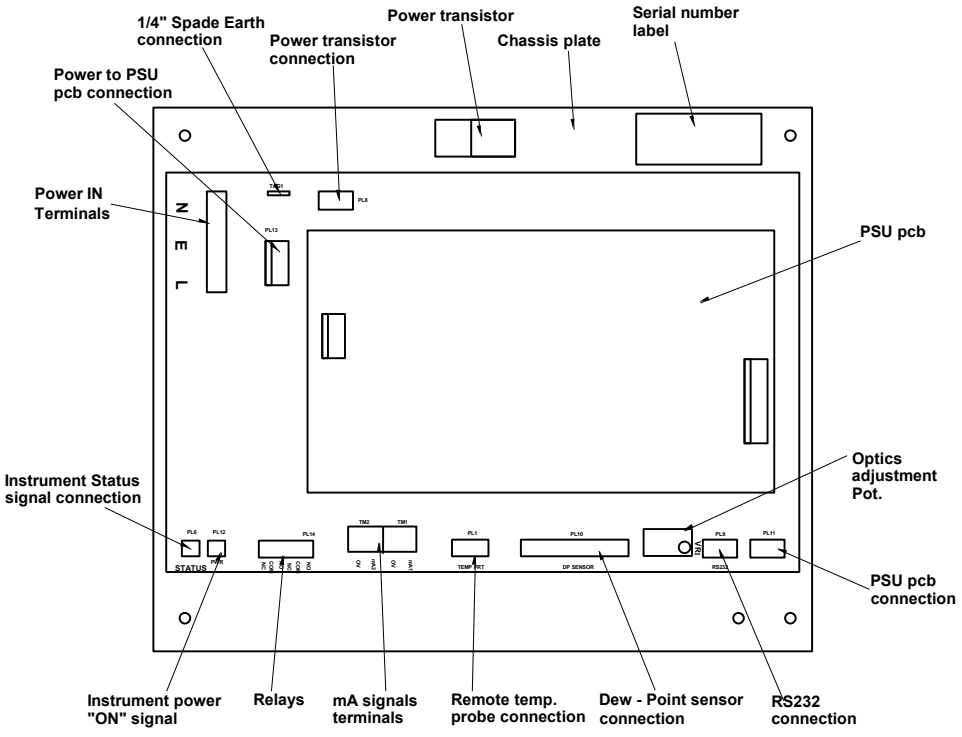


Fig. 1 Instrument Connections

2.1 Electrical Power Supply

90-264 VAC, 47-440 Hz, 20 Watts max.

The power connector supplied must be wired as follows:

L = Live. E = Earth. N = Neutral.

WARNING: This instrument must be EARTHED

NB: The SMS Optidew is designed for continuous operation and therefore does not feature a power on/off switch. As soon as power is applied, the power "ON" signal will be active and the transmitter will initiate a DCC cycle, initiating the system status signal (see section 3 Operation for more details).

2.2 Output Connections

Current Outputs
The SMS Optidew provides two current source outputs, which can be set to either 4-20 or 0-20 mA and scaled by the user over the range –200 to +1000 by use of the supplied application software. The Channel1 mA output can be set for dew point, % rh, gm^{-3}, gkg^{-1}, temperature, or $\Delta(t - t_{dp})$. Channel2 outputs temperature only.

mA Output	**connections**
Channel1- dew point, % rh, gm^{-3}, gkg^{-1}, temperature, $\Delta(t - t_{dp})$	TM1
Channel1 0 V	TM 1
Channel2 temperature	TM 2
Channel2 0 V	TM 2

Relay Outputs
There are two sets of relay outputs available via the PL14 connector. They are the optics fault/alarm relay and a status relay. The optics fault/alarm relay changes state either to indicate that the sensor mirror and optics require cleaning (the red status led will flash to provide a visual indication of this fault) or when the process variable exceeds the alarm set-point value (no visual indication).

The status relay changes state when the instrument is in DCC (Dynamic Contamination Control), Data Hold, or if the system has an optics fault.

Output	**PL14 connections**
Optics Fault / Alarm Relay N/O	Pin 6
Optics Fault / Alarm Relay COM	Pin 5
Optics Fault / Alarm Relay N/C	Pin 4
Status Relay N/O	Pin 3
Status Relay COM	Pin 2
Status Relay N/C	Pin 1

PL9 Communications Port
The RS232 connector, PL9, is used to communicate with the Optidew via the application software, or by an ASCII terminal program. The communication interface is RS232 as standard or RS485 as a factory settable option.

9 way D Pin No.	PL9 pin No.	RS232	RS485
2	1	Tx	B
3	2	Rx	A
5	3	GND	GND

Remote Temperature Probe
PL 1 is for the connection of a remote temperature probe.

PL1 pin No.	4 wire PRT connection
1	PRT a
2	PRT b
3	PRT a
4	PRT b

PL12 Power signal
Indicates power to the Optidew is applied.
Pin 1= Pos.
Pin 2 = Neg.

PL6 Instrument Status signal
The status signal is an open collector output which is driven low to indicate that the instrument is either in DCC (Dynamic Contamination Control) or Data Hold mode. If the signal changes state it indicates an optics fault.

PL10 Sensor Connection
The SMS Optidew sensor is fitted with a bayonet type connector and connected to the processor pcb, for Option 1, via a sensor cable loom directly to PL10, or for Option 2 via 1.1 metre sensor cable connected to bulkhead connector and an intermediate cable loom to PL10.

3 Operation

3.1 DCC

Dynamic Contamination Control (DCC) is a unique compensation system that eliminates a loss of measurement accuracy, due to mirror surface contamination. DCC consists of a self-learning prediction algorithm that adapts itself to its operating conditions, to achieve optimum performance at all times. Although fully automatic, fine-tuning is possible to suit extreme operating conditions.

At switch-on the system initiates a DCC to measure the surface condition of the mirror. During this phase, the mirror surface is heated above the dew-point and the instruments' status is indicated by the display, status LED and the setting of Channel1 mA output to 23mA. Expiry of the DCC duration will result in the system cooling the mirror surface to form condensation. Once system control is reached, the measurement phase will begin, indicated by the change in status of the instrument and reflection of the measured parameter in Channel1 mA's value.

The system will remain in the measurement phase until expiry of the measurement time, after which a DCC will initiate, whilst maintaining Channel1's mA value. During this and subsequent

DCC's, the new level of mirror contamination is compared with the one before and if above a predetermined level, will initiate an increase in the mirror temperature to drive off any residual condensate before recording the new level of contamination. The duration of the increased mirror temperature, can be up to four times the DCC duration, depending upon conditions.

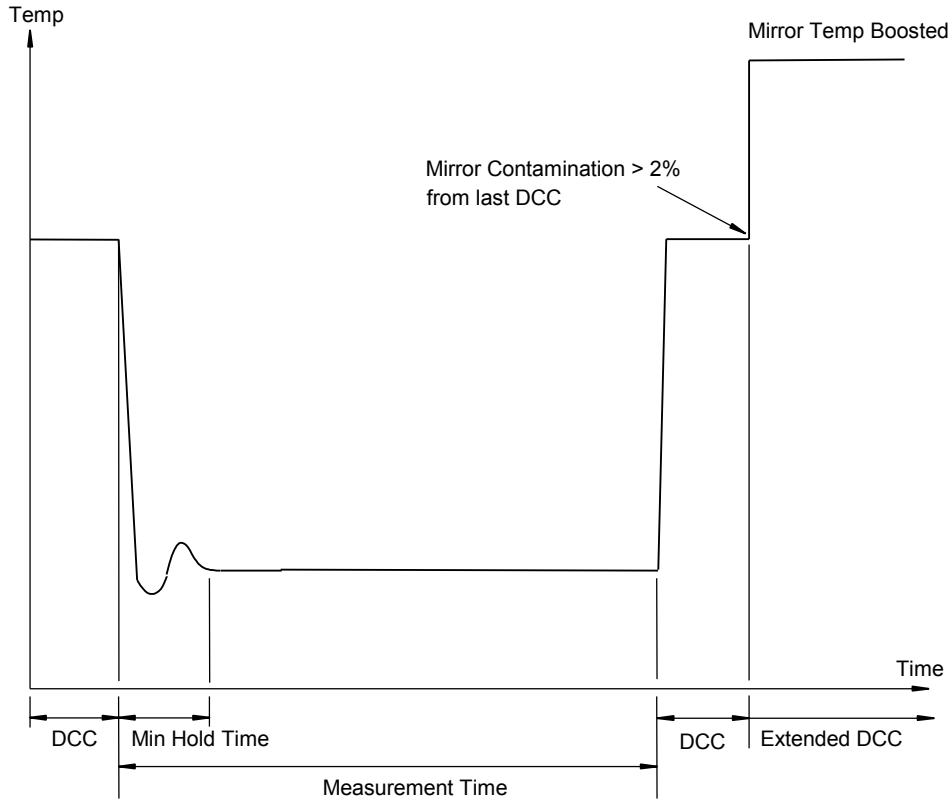


Fig. 2 A Graphical Representation of System Phases.

3.2 Data Hold Phase

During Data Hold, the level of the Channel1 mA output is held, and the Status Relay and LED are energized & illuminated respectively, until the system has stabilized onto the measured dew point. The Data Hold phase will finish when the following two conditions are met:

i) the minimum hold time has expired
and
ii) the system is stable to within a specified stability band.

The minimum hold time is nominally set to 4 minutes, and generally under most conditions the system will be stable within this time period. However, there may be some conditions where the system may take longer to stabilize, so under these conditions an adaptive hold algorithm takes over to determine when stability is reached. If under extreme conditions the system fails to stabilize to within the set stability band, the Data Hold phase will terminate when the maximum hold time is reached.
When the Data Hold finishes, the Status LED will turn off, the Status Relay will de-energise, and the hold on Channel1 mA output will be released. The system will now be in its continuous measurement phase, where it will remain until the measurement time has elapsed and the next DCC cycle initiates.

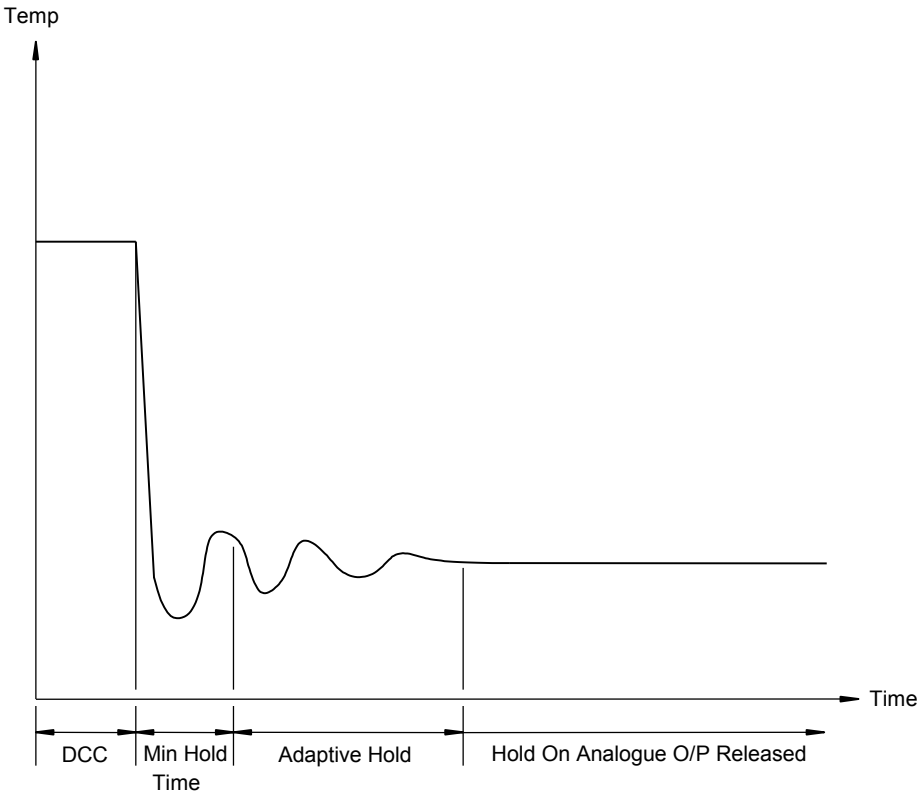


Fig. 3 A Graphical Representation of the Data Hold Phase.

4 Maintenance

The SMS Optidew instrument will arrive ready for operation. However, throughout the life of the instrument, periodic cleaning of the Sensor mirror surface and optics window may be required, depending upon operational conditions and exposure of the sensor to contamination. Sensor cleaning is mandatory if the instrument indicates an optics fault. The cleaning procedure is as follows:

a) Switch the instrument off, or, if it is required to leave it on, a DCC cycle must be performed (See Section 3.1). Remove the guard (if fitted) from the sensor, or the sensor from its sampling point in the case of a remote version.

b) Clean the mirror surface and optics window with a cotton bud soaked in distilled water. If the sensor has been exposed to oil based contamination, then use one of the following solvents: methanol, ethanol, or isopropyl alcohol.

c) When cleaning is complete, switch the instrument on if necessary and observe the mirror contamination value during the DCC phase. If this value is not 0 %, then adjust the potentiometer VR1 until this value is reached, ensuring that the adjustments are made ONLY during the DCC phase. If this value is under-range the display will flash 0 %, indicating that a positive adjustment is required.

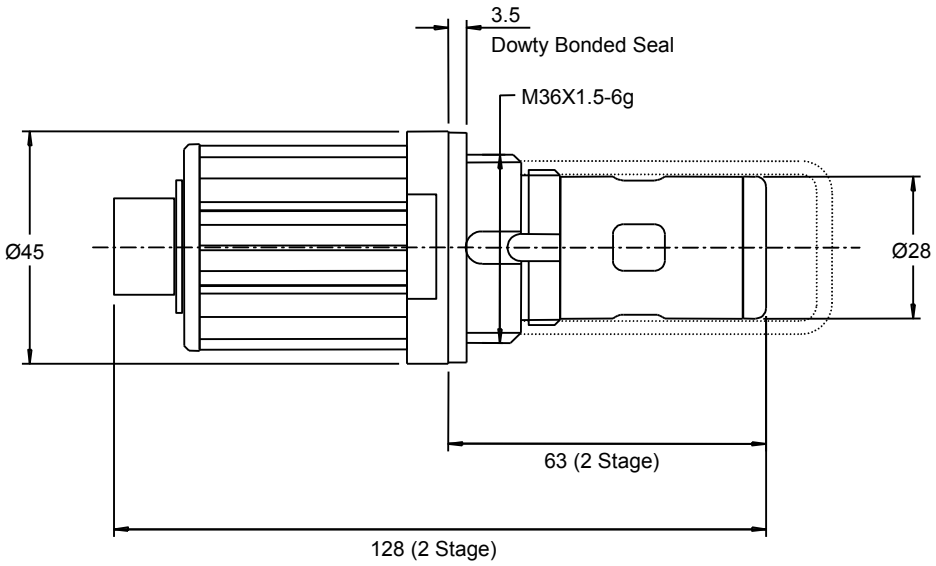
Note: There will be a delay of approx 5 seconds between the actual adjustment and the displayed value changing. PCB.

APPENDIX A Technical Specification

General

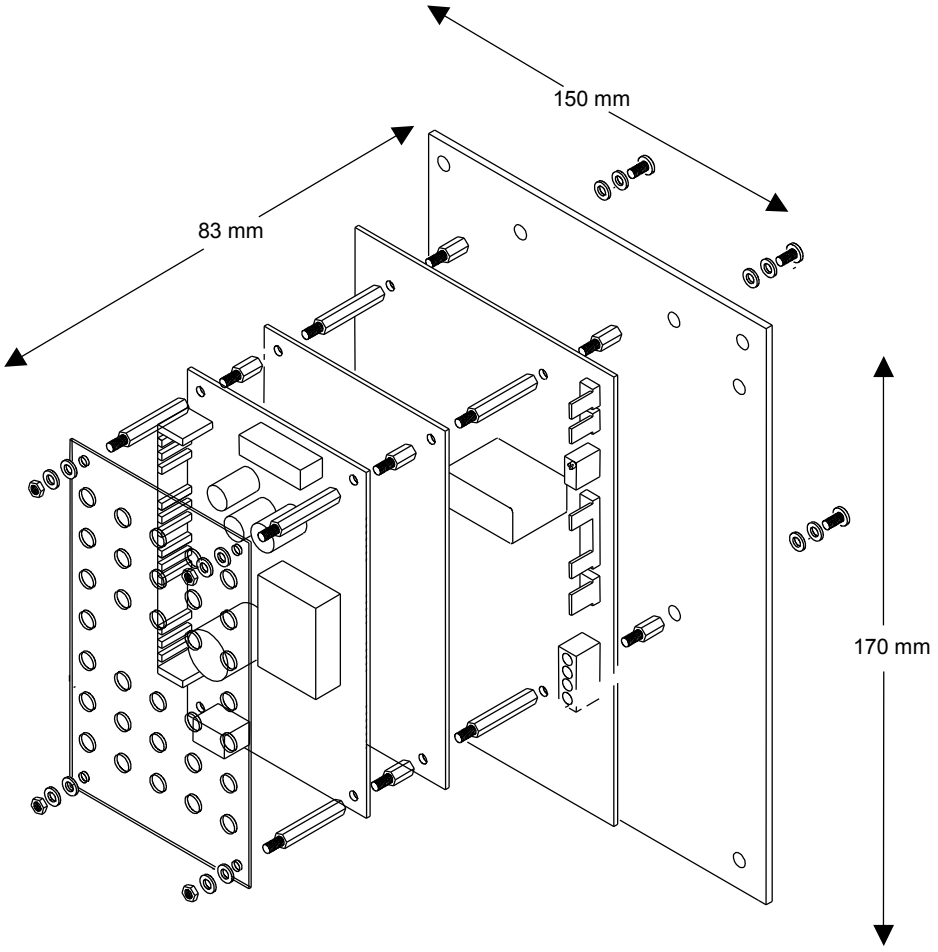
Overall Accuracy	±0.2 °C dew point, ±0.2 °C temperature
Measurement Units	dew point (°C/°F), % rh, temperature (°C/°F), gm^{-3}, gkg^{-1}
Response Speed	1 °C sec^{-1}
Power Supply	90-264 V, 47-440 Hz, 20 W max. Internally fused, 4 A quick blow.
Sensor	**Dual Stage**
Dew-point range	-60 to +90 °C
Temp range	-40 to +90 °C
rh range	<0.5 to 100 %
Depression @ 21 ambient °C	-45 °C
Mirror	Gold plated copper
Temp Measurement	4 wire 100 Ω platinum resistance thermometer
Sample Flow	0.1 to 2 $Nlmin^{-1}$ (in sampling block)
Max Velocity	10 $msec^{-1}$ (direct insertion)
30 $msec^{-1}$ (with sintered guard)	
Pressure	25 MPa (max)
Cable length	Option 1: 1.10 metre cable loom Option 2: 1.10 metre Sensor cable. Plus 300mm cable loom
Electronics	
Resolution	0.1 °C
Outputs	analogue: 4-20 mA or 0-20 mA over user settable output
Accuracy ±0.5 °C	
500 ☛ Maximum Load Resistance	
	digital: RS232 @ 9600 baud rate
	alarm: volt free contact, 2A @ 30 V dc, 0.5 A @ 120 V ac
	LED: Status/Optics Alarm
Operating Temp	-20 to +40 °C
Environmental Conditions	Up to 98 % rh non-condensing.

APPENDIX B Sensor Dimensions



Sensor Overall Dimensions

APPENDIX C Assembly Dimensions



Assembly Dimensions (Maximum Assembled).

APPENDIX D Hazardous Products

The Consumer Protection Act 1987, Section 6 of the Health and Safety at Work Act 1974 and the Control of Substances Hazardous to Health Regulations 1988, require that we advise the recipients and users of our products of any potential hazards associated with their storage, handling or use.
As the product detailed in this instruction manual contains a large number of components, both metallic and non-metallic, it is not practicable to issue full details of either all their constituents, substances or of the circumstances in which any of them may become hazardous.
We can, however, state that the product detailed in this manual and all of our other products are not hazardous to health when stored and used within the technical and environmental limitations specified in our relevant catalogue or specification sheet.
Should you require any further specific information regarding individual components of this product, please contact our Technical Sales Department.

APPENDIX E
RECYCLING

Michell Instruments Limited is concerned with the protection of the environment. It is our commitment to reduce and eliminate from our operations, wherever possible, the use of substances which may be harmful to the environment. Similarly, we are increasingly using recyclable and/or recycled material in our business and products wherever it is practical to do so. The product you have purchased may contain recyclable and/or recycled parts and we will be happy to provide you with information on these components should you desire it.

APPENDIX F WEEE & RoHS

The Waste Electronic and Electrical Equipment (WEEE) Directive, and the Restriction of Hazardous Substances (RoHS) Directive place new rules upon European manufacturers of electrical and electronic equipment. The Directives aim to reduce the impact that electronic devices have on the environment.

Michell Instruments are aware of the WEEE and RoHS Directives, and have investigated their requirements. Michell products are currently exempt from the RoHS Directive, however all future products will be developed entirely using compliant materials. Furthermore, Michell is taking active steps to remove non-compliant materials and components from existing products wherever possible.

Michell is also progressing towards full compliance with the WEEE Directive. In the short term this will result in additions to product labelling, though in the long term customers may be required to return certain instruments for treatment at the end of their working life.

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APPENDIX G Customer Contact Details

For advice on this, or any other Michell Instruments product, please feel free to contact us via our Web site: www.michell.com