

See Humidity in a Whole New Light

Optica
Optica

Precision Hygrometry via the World Wide Web



*NIST Traceable Humidity
Reference Chilled Mirror*



GE Measurement & Sensing Technologies
General Eastern Instruments

Optica

The Next-Generation Humidity Reference Standard

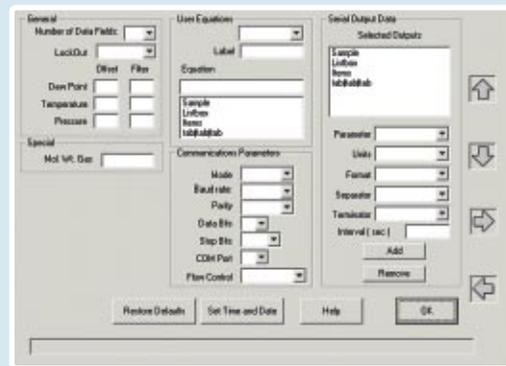
GE General Eastern's Optica series chilled mirror hygrometers offer NIST traceable humidity, temperature and pressure measurements for the connected generation. Now, data is accessible from anywhere, any time, from within a browser over the Internet or your Intranet. It's imagination at work.



Optica Measures

- Temperature
- Relative Humidity (%RH)
- Dew/Frost Point (Td)
- Absolute Humidity (m/v)
- Mass Mixing Ratio (m/m)
- Volume Mixing Ratio (v/v)
- Wet Bulb (Tw)
- Enthalpy (h)
- Water Vapor Pressure (e)
- Pressure
- Alarm Relays
- Analog Outputs

Fundamental dew point measurement is a primary measurement used as a transfer standard for calibrating other humidity instruments and sensors. Chilled mirrors are also the sensor of choice where process and laboratory measurements call for high precision without long term drift. Optica may be used with a choice of five, fully interchangeable chilled mirror sensors to provide a measurement range from -80 to +85°C dew point with 0.2°C or better accuracy. Inputs for a 100 Ω RTD and silicon based piezoresistive pressure transducer ensure precision measurements which are used to convert the dew point to any metric, English or user defined unit of humidity measure.



Optica software is easy to navigate. Users

select readout display, strip chart,

analog output scale, digital

communications, self-diagnostics,

cleaning and data logging with

intuitive pull-down menus. Setup

values can be saved in memory and

loaded anytime, either locally or from

anywhere via the Ethernet port.

Optica Communicates

- Ethernet Port
- Java Based Applet Loads in Web Browsers
- Data Logger 6 Mbyte Memory
- Recorded Data Uploads in ASCII Format
- Exports to Spreadsheets
- Real-Time "Stripchart" Graphing
- Color VGA or 4x40 Matrix Display

www.geoptica.com

Optica

In the Lab or on the Plant Floor

Calibration Labs
Process Control
Clean Rooms
Environmental Test Chambers
Precision HVAC Monitoring & Control
Fuel Cells
Heat Exchanger and Refrigerant Coil Calorimeters

Thermal Processing / Heat Treating
Semiconductor Manufacturing
Storage Areas
Pharmaceutical Validation Chambers
Engine Test Cells & Emissions Testing
Aircraft Engines and Turbines

Optica Grows

Optica is fully expandable. The basic unit supports one chilled mirror, temperature and pressure sensor. A second channel may be added to support two sets of sensors or a module which measures eight temperature sensors. The dual input configuration may be used for testing inlet/outlet conditions of dryers, heat exchangers and indoor/outdoor conditions. The temperature expandability is ideal for measuring humidity and temperature gradients in environmental test chambers. The Optica computes % RH for each temperature location based on a single uniform dew point measurement. Optica is available in benchtop, rack-mount bracket or wall mounted configurations.

"Plug and play" setup is easily accomplished with standard connectors for power, sensor and analog outputs.



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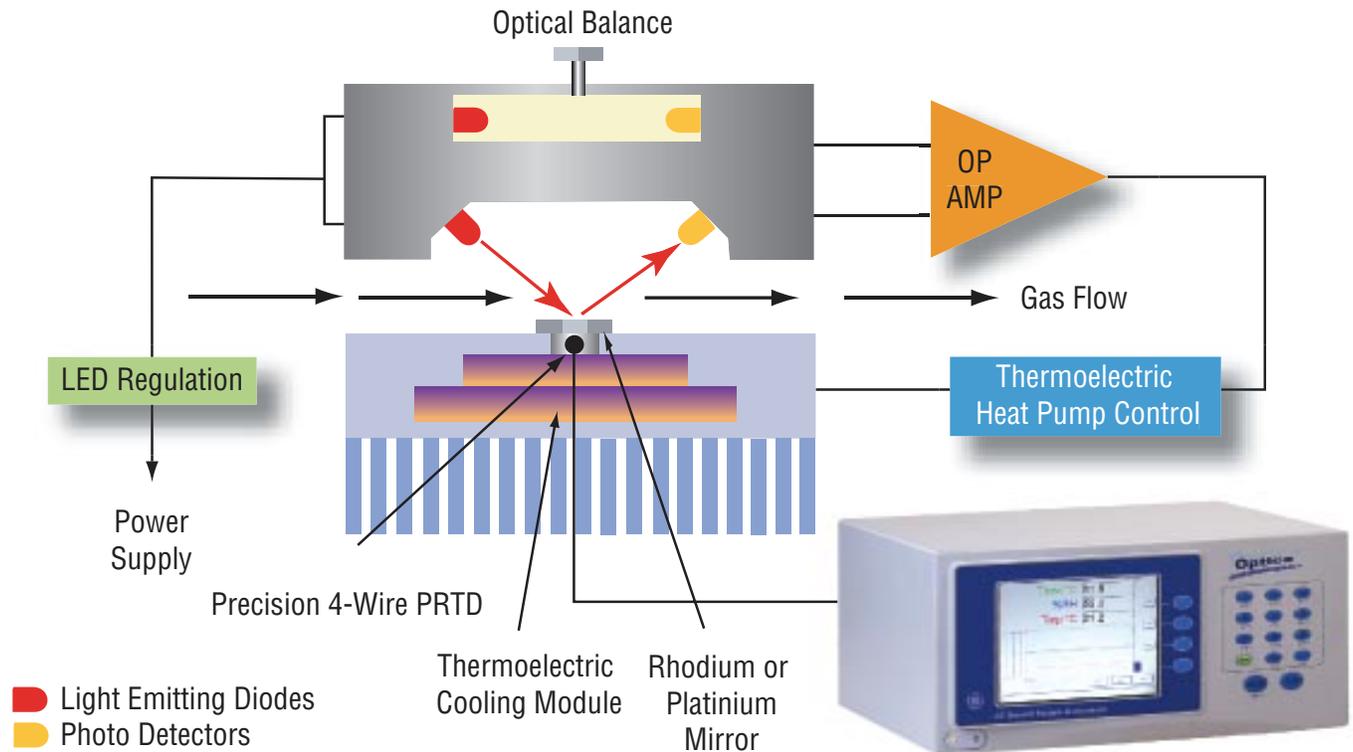
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Chilled Mirror Sensors

Theory of Operation

Precision Sensing



Chilled Mirror Hygrometers are used in Standards and Metrology labs as well as in industrial applications where precise and repeatable humidity measurement and control is required. The inherent accuracy and long term stability provides many advantages over other types of humidity measurement technologies. Chilled mirrors fundamentally measure the dew or frost point temperature directly by controlling a reflective surface to an equilibrium temperature between dew/frost formation and evaporation and precisely measuring the temperature of the mirror at this point.

GE General Eastern's chilled mirrors consists of a small polished hexagonal Rhodium, or Platinum Mirror attached to Thermoelectric cooling module (TEC). The Optica monitor's servo controller applies current to the TEC which causes the mirror to cool. The mirror is illuminated with a regulated GaAs emitter which transmits light in the infrared spectrum. The light reflected by the mirror is received by a photodetector. When water vapor condenses on the mirror as water or frost (ice crystals), the light received by the photodetector is reduced due to scattering. This results in the servo controller reducing the power causing the mirror to slightly warm. The Optica's control system will modulate the amount of current flowing through the TEC to maintain a temperature where the rate of condensation and evaporation of water molecules and the mass of water on the mirror is constant. The resulting temperature of the mirror is then, fundamentally, by definition, equal to the dew or frost point temperature. A precision four-wire Platinum RTD imbedded in the mirror measures the temperature. The accuracy of the dew point measurement has been validated to an accuracy of $\pm 0.2^{\circ}\text{C}$ dew/frost point. The precision can also be

enhanced to $\pm 0.15^{\circ}\text{C}$ dew/frost point.

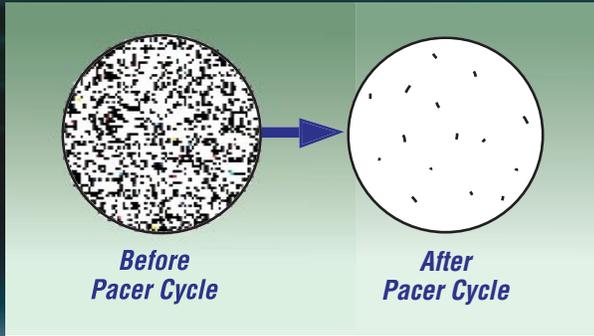
Dry bulb temperature is measured with a precise 4-wire 100 Ω Platinum RTD and Pressure is measured with a piezoresistive silicon pressure transducer. The dew/frost point and dry bulb RTD resistance signals are conditioned and amplified by the Optica monitor to display and transmit dew/frost point and temperature. The pressure sensor transmits a amplified 4-20mA signal which is powered by the Optica. The cardinal measurements of dew/frost point, dry bulb temperature and pressure are used to calculate other humidity parameters such as relative humidity, wet bulb, mass mixing ratio, volumetric mixing ratio, absolute humidity, enthalpy and water vapor pressure values using psychrometric equations.

The RTD sensor is imbedded in the chilled mirror and never comes in contact with the process or test environment. The wetted parts consist of the Platinum or Rhodium Mirror, stainless steel or Mylar vapor barrier and epoxy sealant. The net result is drift free humidity measurement designed to maintain accuracy specifications for many years.

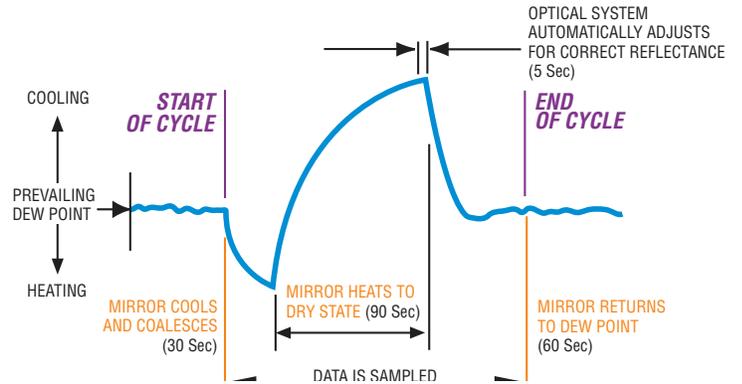
Chilled Mirrors require a nominal flow rate across the mirror to achieve the optimal dew/frost formation and response time. The sensor should either be installed in a duct with moving air or be equipped with a sampling pump. The optimum flow rate is 0.5 to 5 SCFH (0.25 to 2.5 L/min). GE General Eastern provides sampling systems to temperature condition, regulate the pressure and filter process air prior to the chilled mirror. Our applications engineers would be pleased to discuss your application in detail and provide a recommendation for the system best suited to your needs.

Self Cleaning & Digital Control

PACER Cycle



Typical PACER Cycle

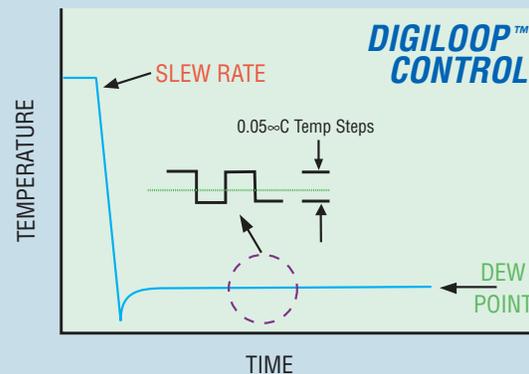
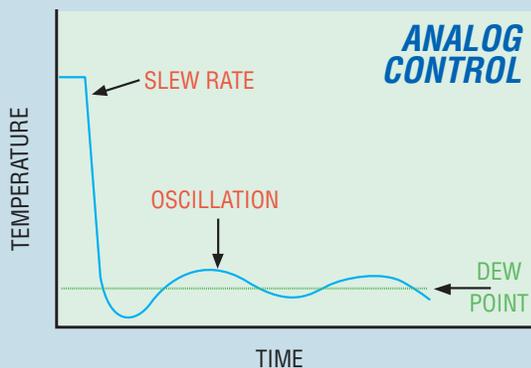


For environments where physical contaminants such as dust, oil mist and pollen are present, the use of a sampling system with a filter media is recommended. The filter media must be hydrophobic as to not absorb or release water vapor into the test stream. Over time the mirror can be etched or pitted by particulate altering the light scattering characteristics. General Eastern's mirrors are field replaceable. The standard Rhodium mirror may be upgraded to Platinum for industrial applications.

GE General Eastern developed a patented contamination compensation scheme called PACER (Program Automatic Error Reduction). The PACER cycle may be initiated manually or by programming a timed cycle. The cycle starts by capturing the data (during the PACER cycle a constant reading is displayed and transmitted) and cooling the mirror well below the dew point such that a thick dew layer forms on the mirror. The mirror is then rapidly heated. During the heating a significant amount of soluble and some non-soluble contamination is flash evaporated. The contamination left on the mirror tends to aggregate in dry islands or spots (much like a glass that comes out of a dishwasher). This process leaves approximately 85% of the mirror clean. The light signal received by the photodetector is compared against a

reference LED/Photodetector and the two signals are "balanced", effectively negating the effect of the residual contamination left on the mirror. The PACER cycle works very well, but eventually manual cleaning might be required. All of General Eastern's chilled mirrors are accessible for manual cleaning. Cleaning is a simple process consisting of wiping the mirror with a cotton swab wetted with cleaning solution or distilled water. (Distilled water is recommended as the last cleaning agent).

GE General Eastern developed Digiloop control to overcome the limitations of traditional analog PID (Proportional Integral & Derivative) control. Analog temperature control produces oscillations particularly at high or trace humidity levels. It is difficult to apply self-tuning or PID constants to analog control loops which are over damped or under damped. Digiloop utilizes digital sampling and feed-forward control by taking time-based samples when the dew point is within a predetermined proportional band. By recording the oscillations, the digital control effectively predicts the magnitude of change and adjusts the current to the thermoelectric cooling module which steps the mirror temperature in 0.05°C increments. This results in a significantly improved control and dew point precision.



Optica Monitor Specifications

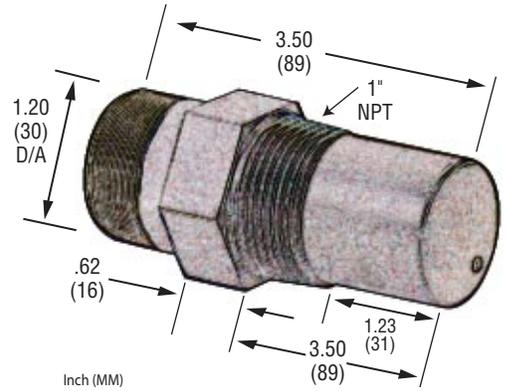


Inch (MM)

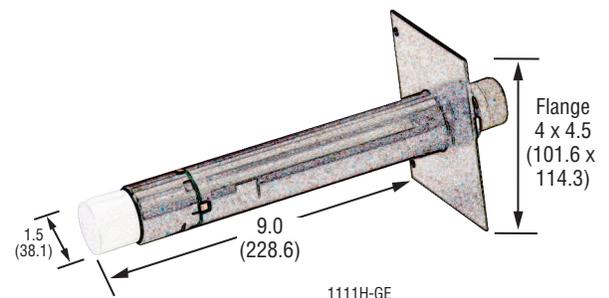
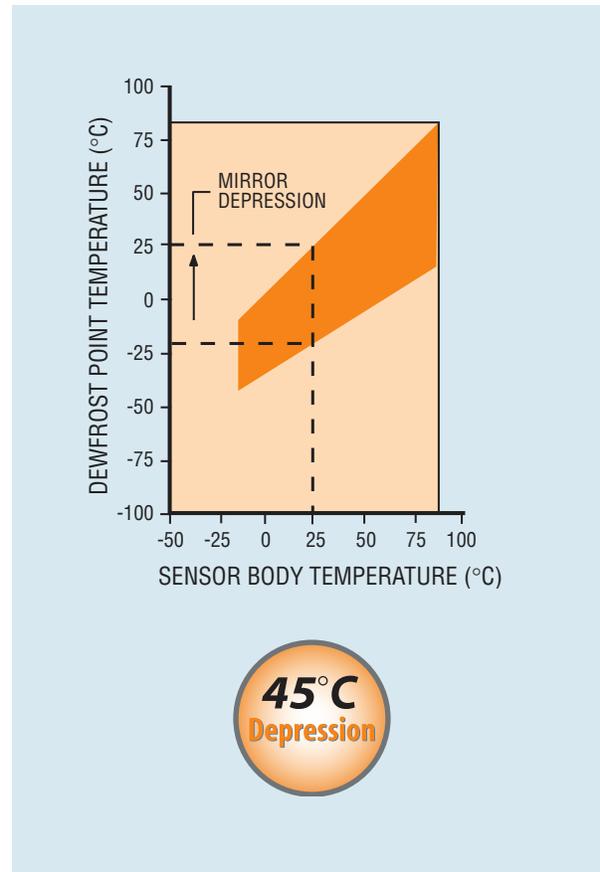
Models	Color VGA with datalogger and Ethernet communications available in bench, rack or wallmount styles 4 x 40 dot matrix available in bench, rack or wallmount styles	
Power	95-265 VAC, 50-60 Hz, 200 Watts	
Electrical I/O	IEC Style AC Receptacle (Benchmount), Screw Terminal Block (Wall Mount), Multipin Chilled Mirror & Temperature Sensor/Cable Connectors, Screw Terminals for Analog Outputs, DB-9 for RS-232 & 10 Base-T for Ethernet*	
Measured Parameters	Dew Point, Temperature & Pressure	
Calculated Parameters	Relative Humidity, Wet Bulb, Mass Mixing Ratio, Volumetric Mixing Ratio, Absolute Humidity, Water Vapor Pressure, & Enthalpy in English and Metric Units as Well as User Configured Units.	
Inputs	1/3 Class A DIN 43760, 100Ω RTD & for Dew/Frost Point & Dry Bulb Temperature. Loop Powered 4-20mA DC at 500Ω Max Load for Pressure	
Accuracy	System Accuracy, ±0.2°C (±0.15°C on Special Order) for Dew/Frost Point, ±0.15° C for dry bulb temperature (±0.10° C on special order) 0.5% FS for Pressure	
Range	Governed by Sensor	
Hysteresis	Negligible	
Sensitivity	0.1% Full Scale	
A/D	16 Bit	
Datalogger Memory	6 Megabytes*	
Display	1/4 Color VGA Enables up to (6) Parameters to be Displayed or 4X40 Dot Matrix Enables (3) Parameters to be displayed	
Operating Temperature	0-50°C (32-122°F)	
Cooling Rate	1.5°C (2.7°F)/Sec Typical Above 0°C.	
Digital Interface	RS-232 Port, Ethernet Port*	
Digital Output Format	Data ASCII Text, Ethernet Java Applet Password Protected*	
TCP/IP Address	Factory Default / User Assigned*	
Analog Outputs	(2) 4-20mA & 0-5VDC User Configurable and Scalable	
Alarm Outputs	(2) 5A at 250V, Form C, (SPDT) Relays	
Enclosure	Bench-Top NEMA 1	Wall Mount NEMA 4
Weight	Bench-Top 8 lbs. (3.6 kg)	Wall Mount 10 lbs. (4.5 kg)

* Feature available with VGA models only

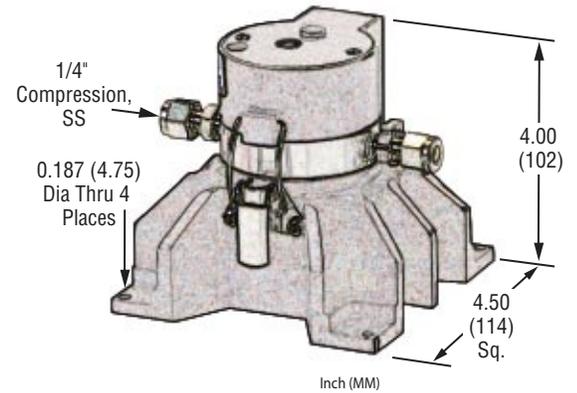
1111H Single Stage Chilled Mirror



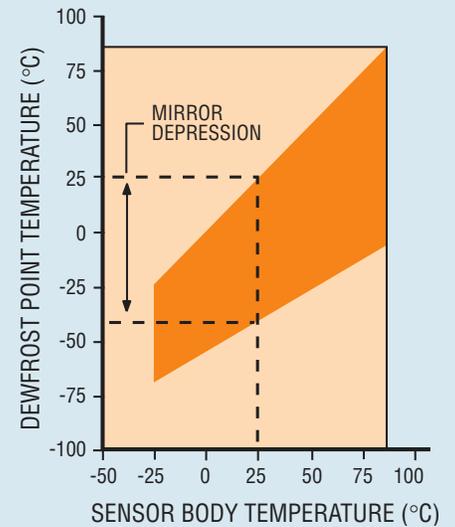
Sensing Element	4-Wire 1/3 Class A DIN 43760 PRT, 100Ω @ 0°C (32°F)
Dew/Frost Point Accuracy	Standard: ±0.2°C (±0.36°F), Optional: ±0.15°C (±0.27°F)
Sensitivity	> 0.03°C (0.05°F)
Repeatability	±0.05°C (±0.09°F)
Hysteresis	Negligible
Cooling Stages	Single Stage TEC Module
Auxiliary Cooling	Not applicable
Depression	45°C (81°F) at 25°C Dry Bulb and Atmospheric Pressure
Typical Measurement Range	-15° to +25°C (+5° to 77°F) Dew/Frost Point (Td) in Air @ 25°C (77°F) and Atmospheric Pressure. Equivalent to 6 to 100% RH. Other humidity parameters based on calculations
Sample Flow	0.5 to 5.0 SCFH (0.25 to 2.5L/min)
Operating Temperature	-15° to +80°C (+5 to 176°F)
Pressure	-3 to 200 PSIG (0.8 to 15 Bar)
Power	Derived from Optica
Sensor Body	Epoxy-Coated Aluminum
Filter	PTFE Filter (Standard on 1111H-GE)
Mirror	Rhodium Plated Copper Standard. Solid Platinum Optional
Sensor Wetted Material	Aluminum, Copper, Mylar, Teflon, Rhodium or Platinum
Vapor Barrier	Mylar
Electrical Connector	MS Style Multipin Connector Mates with 2120 Cable
Weight	1Lb (1.4 Kg) Net
Accessories	
MB-11	Wall Mounting Bracket
PTFE-GE	PTFE Filter
P	Platinum Mirror
X	Enhanced Accuracy: ±0.15°C Td
O111D	Pressure Boss (1111H only)



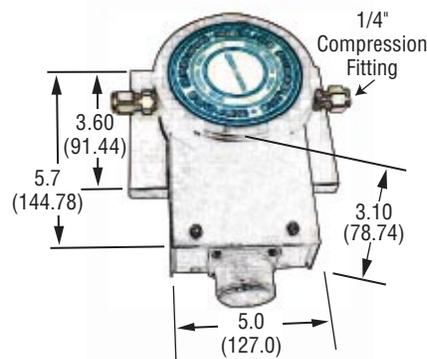
D2 Two Stage Chilled Mirror



Sensing Element	4-Wire 1/3 Class A DIN 43760 PRT, 100Ω @ 0°C (32°F)
Dew/Frost Point Accuracy	Standard: ±0.2°C (±0.36°F), Optional: ±0.15°C (±0.27°F)
Sensitivity	> 0.03°C (0.05°F)
Repeatability	±0.05°C (±0.09°F)
Hysteresis	Negligible
Cooling Stages	Two Stage TEC Module
Auxiliary Cooling	Not applicable
Depression	65°C (81°F) at 25°C and Atmospheric Pressure
Typical Measurement Range	-35° to +25°C (-31° to +77°F) Dew Point/Frost Point (Td) in Air at @ 25°C (77°F) and Atmospheric Pressure. Equivalent to 1.5 to 100% RH. Other parameters based on calculations
Sample Flow	0.5 to 5.0 SCFH (0.25 to 2.5L/min)
Operating Temperature	-25° to +85°C (-13° to +185°F)
Pressure	-14.7 to 150 PSIG (0 to 11 Bar)
Power	Derived from Optica Monitor
Sensor Body	Cast Aluminum with 314 Stainless Steel Flow Cell
Mirror	Rhodium Plated Copper Standard. Solid Platinum Optional
Sensor Wetted Material	302, 316 Stainless Steel, Silicone O-Ring, BK-7 Glass, Rhodium or Platinum Mirror
Vapor Barrier	Mylar (Upgradeable to Stainless Steel)
Inlet/Outlet	1/4" (6mm) OD Tubing Compression Fittings
Electrical Connector	Sub-D Multipin Connector Mates with 2130 Cable
Weight	4 Lbs (1.8 Kg) Net
Accessories	
P	Platinum Mirror
X	Enhanced Accuracy: ±0.15°C Td
S	Stainless Steel Vapor Barrier

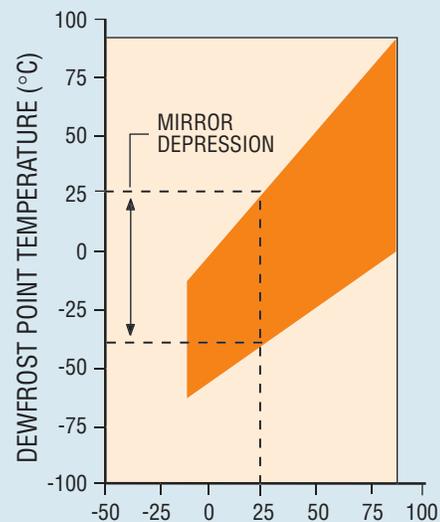


1211H Two Stage Chilled Mirror

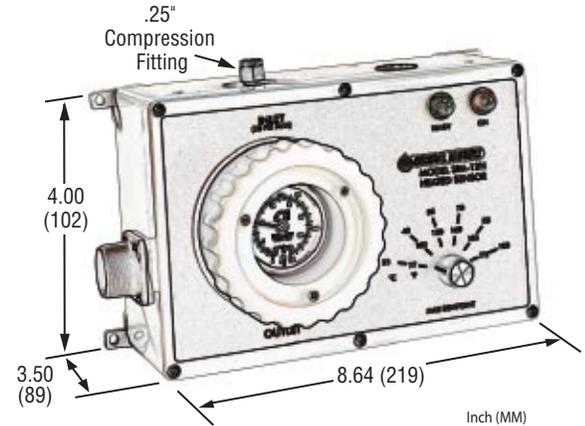


Inch (MM)

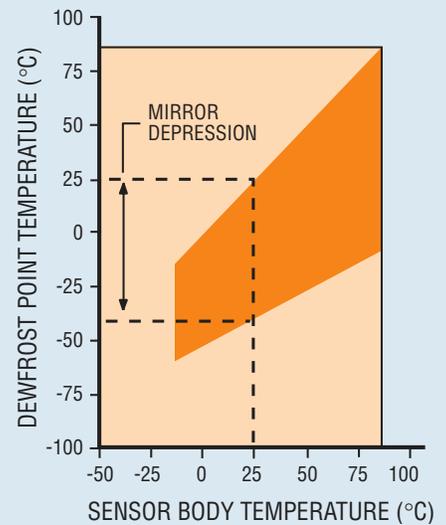
Sensing Element	4-Wire 1/3 Class A DIN 43760 PRT, 100 ohm @ 0°C (32°F)
Dew/Frost Point Accuracy	Standard: $\pm 0.2^{\circ}\text{C}$ ($\pm 0.36^{\circ}\text{F}$), Optional: $\pm 0.15^{\circ}\text{C}$ ($\pm 0.27^{\circ}\text{F}$)
Sensitivity	$> 0.03^{\circ}\text{C}$ (0.05°F)
Repeatability	$\pm 0.05^{\circ}\text{C}$ ($\pm 0.09^{\circ}\text{F}$)
Hysteresis	Negligible
Cooling Stages	Two Stage TEC Module
Depression	65°C (81°F) at 25°C and Atmospheric Pressure
Typical Measurement Range	-35° to $+25^{\circ}\text{C}$ (-31° to $+77^{\circ}\text{F}$) Dew Point/Frost Point (Td) in Air at @ 25°C (77°F) and Atmospheric Pressure. Equivalent to 1.5 to 100% RH. Other parameters based on calculations
Sample Flow	0.5 to 5.0 SCFH (0.25 to 2.5L/min)
Operating Temperature	-15° to $+100^{\circ}\text{C}$ ($+5^{\circ}$ to 212°F)
Pressure	0 to 300 PSIG (1 to 22 Bar)
Power	Derived from Optica
Sensor Body	Cast Aluminum with 314 Stainless Steel Flow Cell
Mirror	Rhodium Plated Copper Standard. Solid Platinum Optional
Sensor Wetted Material	302, 316 Stainless Steel, Silicone O-Ring, BK-7 Glass, Rhodium or Platinum Mirror
Vapor Barrier	Mylar (Upgradeable to Stainless Steel)
Inlet/Outlet	1/4" (6mm) OD Tubing Compression Fittings
Electrical Connector	MS Style Multipin Connector Mates with 2120 Cable
Weight	4 Lbs (1.8 Kg) Net
Accessories	
P	Platinum Mirror
X	Enhanced Accuracy: $\pm 0.15^{\circ}\text{C}$ Td
S	Stainless Steel Vapor Barrier



SIM-12 Heated Two Stage Chilled Mirror

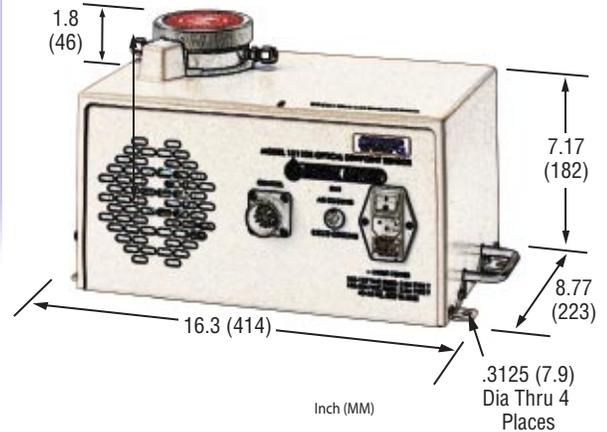


Sensing Element	4-Wire 1/3 Class A DIN 43760 PRT, 100Ω @ 0°C (32°F)
Dew/Frost Point Accuracy	Standard: ±0.2°C (±0.36°F), Optional: ±0.15°C (±0.27°F)
Sensitivity	> 0.03°C (0.05°F)
Repeatability	±0.05°C (±0.09°F)
Hysteresis	Negligible
Cooling Stages	Two Stage TEC Module
Auxiliary Cooling	N/A
Depression	85°C (153°F) at 75°C Body Temperature and Atmospheric Pressure
Typical Measurement Range	-10° to +75°C (14° to 167°F) Dew Point/Frost Point (Td) in Air at @ 75°C (167°F) Body Temperature in 25°C (77°F) Ambient Temperature and Atmospheric Pressure. Equivalent to 1 to 100% RH. Other Parameters Based on Calculations
Sample Flow	0.5 to 5.0 SCFH (0.25 to 2.5L/min)
Operating Temperature	-15° to +100°C (+5° to 212°F)
Heater Control	Thermostatically Controlled. Set Points of 25, 40, 55, 70, 85 & 100°C
Pressure	-3 to 50 PSIG (0.8 to 4.5 Bar) 100/115/230 VAC, 50-60 Hz, 75 Watts.
Sensor Body	Cast Aluminum with 314 Stainless Steel Flow Cell
Sensor Wetted Material	302, 316 Stainless Steel, Silicone O-Ring, BK-7 Glass, Rhodium or Platinum Mirror
Mirror	Rhodium Plated Copper Standard. Solid Platinum Optional
Vapor Barrier	Mylar (Upgradeable to Stainless Steel)
Electrical Connectors	MS Style Multipin Connector Mates with 2120 Cable. Business Style Receptacle for Power.
Weight	7 Lbs (3.2 Kg) Net
Accessories	
P	Platinum Mirror
X	Enhanced Accuracy: ±0.15°C Td
S	Stainless Steel Vapor Barrier
HSS-12	Heated Sampling System. SIM-12 Heated Chilled Mirror, SIM-HFT Heated Filter Module and SIM-HFM Heated Flow Meter mounted on a plate with SIM-HSL Heated Sample Line.

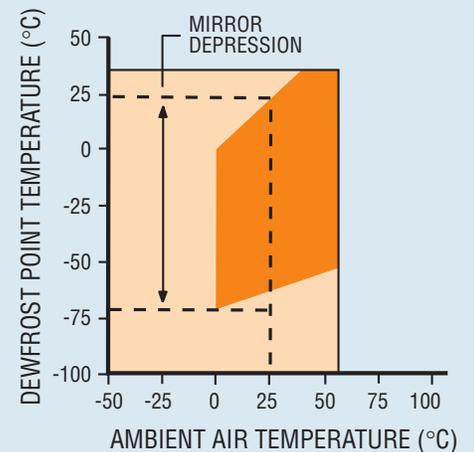


65°C
Depression

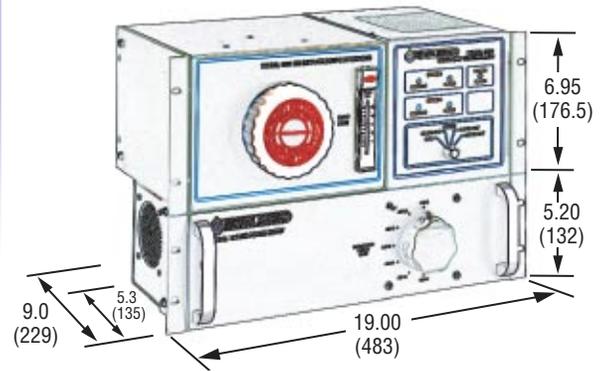
1311-DR Four Stage Chilled Mirror



Sensing Element	4-Wire 1/3 Class A DIN 43760 PRT, 100 ohm @ 0°C (32°F)
Dew/Frost Point Accuracy	Standard: ±0.2°C (±0.36°F), Optional: ±0.15°C (±0.27°F)
Sensitivity	> 0.03°C (0.05°F)
Repeatability	±0.05°C (±0.09°F)
Hysteresis	Negligible
Cooling Stages	Four Stage TEC Module
Auxiliary Cooling	Liquid Cooling Jacket
Depression, Air Cooled	95°C (171°F) at 25°C and Atmospheric Pressure
Depression, Liquid Cooled	105°C (189°F) with 15°C Cooling Water
Typical Measurement Range	-65° to +25°C (-85° to +77°F) Dew Point/Frost Point (Td) in Air at @ 25°C (77°F) and Atmospheric Pressure. -75° to +15°C (-103° to +59°F) in Liquid Cooled Mode with 15°C (59°F) coolant. Equivalent to 0.007 to 100% RH. Other parameters based on calculations.
Sample Flow	0.5 to 5.0 SCFH (0.25 to 2.5L/min)
Operating Temperature	0° to 35°C (32°F to 95°F)
Pressure	0 to 300 PSIG (1 to 22 Bar)
Power	100/115/230 VAC, 50-60 Hz, 300 Watts
Sensor Body	Cast Aluminum with 314 Stainless Steel Flow Cell
Mirror	Rhodium Plated Copper Standard. Solid Platinum Optional
Sensor Wetted Material	302, 316 Stainless Steel, Silicone O-Ring, BK-7 Glass, Rhodium or Platinum Mirror
Vapor Barrier	Mylar (Upgradeable to Stainless Steel)
Inlet/Outlet	1/4" (6mm) OD Tubing Compression Fittings
Electrical Connector	MS Style Multipin Connector Mates with 2120 Cable. Business Style Receptacle for Power.
Weight	34 Lbs (16 Kg) Net
Accessories	
P	Platinum Mirror
X	Enhanced Accuracy: ±0.15°C Td
S	Stainless Steel Vapor Barrier

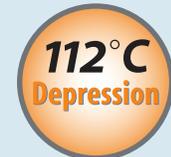
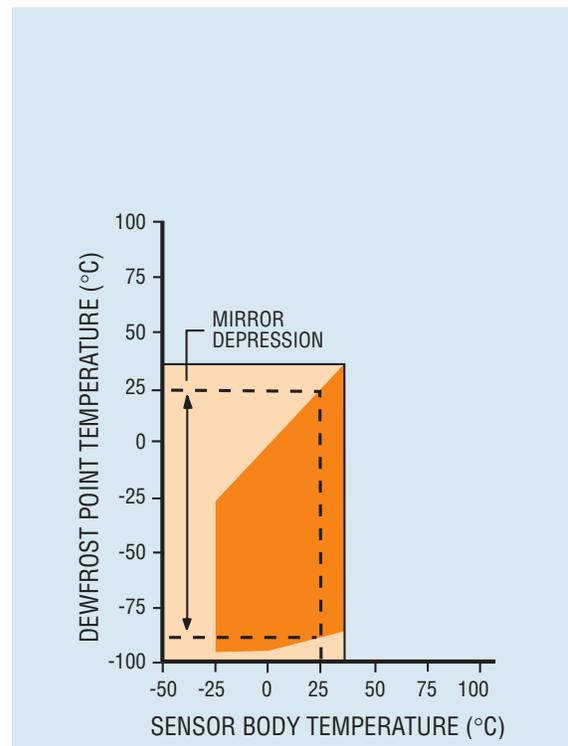


1311-XR Five Stage Chilled Mirror

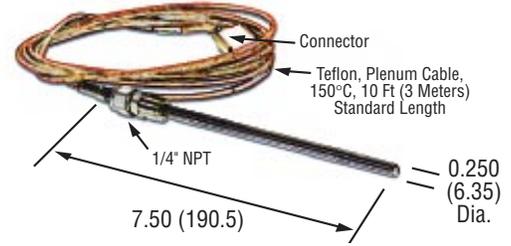


Inch (MM)

Sensing Element	4-Wire 1/3 Class A DIN 43760 PRT, 100 ohm @ 0°C (32°F)
Dew/Frost Point Accuracy	Standard: ±0.15°C (±0.27°F)
Sensitivity	> 0.03°C (0.05°F)
Repeatability	±0.05°C (±0.09°F)
Hysteresis	Negligible
Cooling Stages	Five Stage TEC Module
Auxiliary Cooling	Liquid Cooling Jacket
Depression, Liquid Cooled	112°C (202°F) with 15°C (59°F) Cooling Water
Typical Measurement Range	-80° to +15°C (-112° to +59°F) Dew Point/Frost Point (Td) in Air at @ 25°C (77°F) and Atmospheric Pressure with 15°C Cooling Water. Equivalent to 0.0003 to 100% RH. Other parameters based on calculations.
Sample Flow	0.5 to 5.0 SCFH (0.25 to 2.5L/min)
Operating Temperature	0 to +35°C (32° to 95°F)
Pressure	0 to 100 PSIG (1 to 8 Bar)
Power	115/230 VAC, 50-60 Hz, 700 Watts
Sensor Body	314 Stainless Steel
Mirror	Rhodium Plated Copper Standard. Solid Platinum Optional
Sensor Wetted Material	302, 316 Stainless Steel, Silicone O-Ring, BK-7 Glass, Rhodium or Platinum Mirror
Vapor Barrier	Mylar (Upgradeable to Stainless Steel)
Inlet/Outlet	1/4" (6mm) OD Tubing Compression Fittings
Electrical Connector	MS Style Multipin Connector Mates with 2170 Cable. Business Style Receptacle for Power.
Weight	50Lbs (26 Kg) Net
Accessories	
P	Platinum Mirror
S	Stainless Steel Vapor Barrier



T-100 4-Wire PRTD Temperature Mirror



Inch (MM)

Sensing Element	4-Wire 1/3 Class A DIN 43760 PRT, 100 ohm @ 0°C (32°F)
Accuracy	System at 25°C. Standard: ±0.15°C (±0.27°F), Optional ±0.1°C (±0.27°C)
Measurement Range	-100° to +100°C (-148° to +212°F)
Response Time	7 Seconds for +25° to +70°C (+77° to +158°C) Step Change in Fluid
Sensor Body Material	Stainless Steel
Cable	Teflon Insulation Rated to 150°C (302°F). 3 Meter (10 Ft) Standard Length
Fittings	Adjustable 1/4" NPT Stainless Steel Compression Fitting
Strain Relief	Stainless Steel Spring
Power	Low Voltage Derived from Optica
Weight	2 Lbs (1.8 Kg) Net

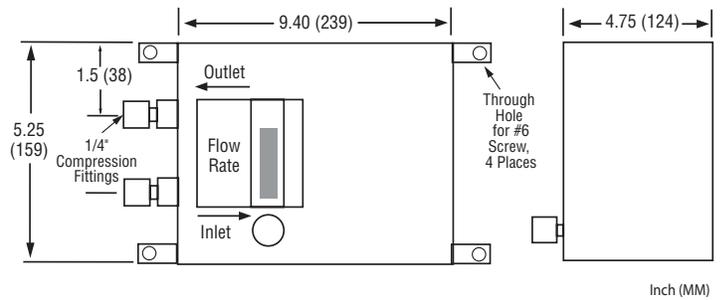
PT Series Pressure Transducer



Sensing Element	Micro-Machined Silicon Strain Gauge
Accuracy	System at 25°C. ±0.5% of Full Scale
Range PT-30A	0-30 PSIA (0-2 Bar)
Range PT-300A	0-300 PSIA (0-21 Bar)
Response Time	1 Second for 90% of Steady State (10-90% Change)
Operating Ranges	-20° to +80°C (-4° to +176°F) Ambient Temperature -25° to +120°C (-13° to 248°F) Process Temperature -40° to +120°C (-40° to 248°F)
Temperature Effect	<1% FS on Accuracy from -10° to +50°C (+14° to +122°F) for Pressure ≥ 6 PSI (0.4 Bar)
Power	9-30 VDC. Derived from Optica Monitor
Sensor Body Material	316 Stainless Steel
Sensor Wetted Material	316 Stainless Steel & Hastelloy Diaphragm
Cable	PVC Insulation. 3 Meter (10Ft) Standard Length Process Connection 1/4" F-NPT
Weight	4 Lbs (1.8 Kg) Net

SSM Sampling System

Enclosure	Polycarbonate
Fittings	Brass 1/4" (6mm) OD Tubing
Compression	
Internal Tubing	Impolene
Rotameter	0.5 to 5 SCFH (0.2 to 2 L/Min)
Maximum Vacuum	-9.8" (-250 mm) of Hg
Free Air Displacement	14 SCFH (6.5 L/Min)
Maximum Temperature	38°C (100°F)
Power	95-265 VAC, 50-60 Hz, 15 Watts



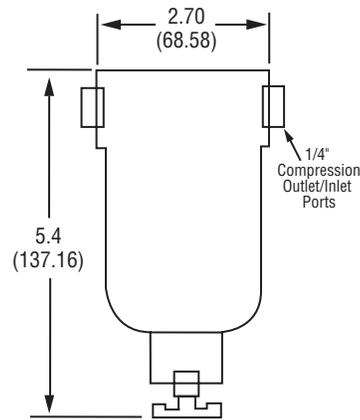
The SSM sampling system consists of a vacuum pump and rotameter/needle valve assembled in a polycarbonate housing. It is used to pull an air sample from environments at or near atmospheric pressure.

Accessories

BF-10 DX General Purpose Filter

Recommended for Dew Points $\geq 0^\circ\text{C}$ (32°F)

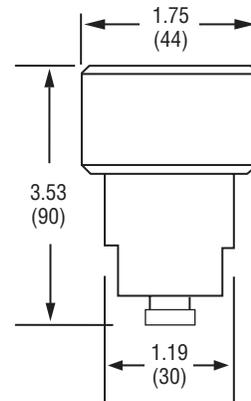
Materials	Anodized Aluminum Head, Nylon Bowl, Nylon Internals, Buna-N Seals
Fittings	1/4" (6mm) Compression
Temperature	-101° to +104°C (-150° to +220°F)
Filter	Borosilicate Glass
Porosity	93% of Particles over 0.1 μM
Pressure	150 PSIG (10 Bar) Max
BF-12SS	Box of 10 Replacement Filter Elements



BF-12 SS Stainless Steel Filter

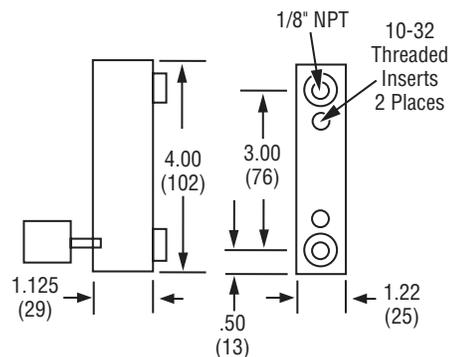
Recommended for Dew Points $\leq 0^\circ\text{C}$ (32°F)

Materials	316 Stainless Steel Head, Bowl and Internals. Viton Seals
Fittings	1/4" (6mm) Compression
Temperature	-101° to +104°C (-150° to +220°F)
Filter	Borosilicate Glass
Porosity	93% of Particles over 0.1 μM
Pressure	5000 PSIG (340 Bar) Max
BF-SS	Box of 10 Replacement Filter Elements



FM-1 Rotameter/Needle Valve

Materials	Clear Acrylic Body, Buna-N Seals, Black Glass Float, Brass Valves
Fittings	Brass 1/4" (6 mm) Compression
Range	0.5 to 5 SCFH (0.2 to 2 L/Min)
Pressure	100 PSIG (6 Bar) Max
Temperature	65°C (150°F) Max



Ordering Code Guide

OPTICA MONITOR

Color VGA Display w/Logger/Ethernet

- A** Benchtop
- B** Benchtop with Rackmount Bracket
- C** Wall Mount

4 x 40 Alphanumeric Display

- D** Benchtop
- E** Benchtop with Rackmount Bracket
- F** Wall Mount

Optica Channel One

- 1** Unit to be sold with New Chilled Mirror (See Sensor Section)
- 2** Use with existing D2 (Conversion Cable 2160 Required)
- 3** Use w/ existing 1111H, 1211H, SIM-12H & 1311DR (Conversion Cable 2160 Required)
- 4** Use w/ existing 1311XR (Conversion Cable 2140 Required)

Optica Channel Two

- 0** None Default Code
- 1** Unit to be sold with New Chilled Mirror (See Sensor Section)
- 2** Use with existing D2 (Conversion Cable Required)
- 3** Use w/existing 1111H, 1211H, SIM-12H & 11DR (Conversion Cable Required)
- 4** Use w/existing 1311XR (Conversion Cable Required)

Chilled Mirror Cable

Cable Type

- 0** No Cable Ordered

Length

- C** 2 ft Standard Length (Only available on 2160 and 2170)
- A** 10 ft Standard Length on 1220 to 1250 Cables
- X** Specify length in ft (only available on 1260 to 2170 Cables for length over 10 ft)

- 2120** For use with 1111H, 1211H, SIM12, HSS-12, 1311DR Sensors
- 2130** For use with D2
- 2140** For use with 1311XR
- 2150** For use with Optica CCD Sensor
- 2160** Adapter Cable for Sensors except 1311XR 2 ft (0.7 m)
- 2170** Adapter Cable for 1311XR 2ft (0.7m)

Chilled Mirror Sensor

Sensor

- 0** No Sensor
- A** 1111H
- B** 1111H-GE
- C** D2
- D** 1211H

SIM-12

- E** 100 VAC
- F** 115 VAC
- G** 230 VAC

HSS-12

- H** 100 VAC
- J** 115 VAC
- K** 230 VAC

1311DR

- L** 100 VAC
- M** 115 VAC
- N** 230 VAC

1311XR

- P** 100 VAC
- Q** 115 VAC
- R** 230 VAC

Accuracy & Mirror

- 1** S/R/M Standard Accuracy, Rhodium Mirror, Mylar Vapor Barrier
- 2** S/P/M Standard Accuracy, Platinum Mirror, Mylar Vapor Barrier
- 3** S/P/P Standard Accuracy, Platinum Mirror, Stainless Steel Vapor Barrier
- 4** X/R/M Enhanced Accuracy, Rhodium Mirror, Mylar Vapor Barrier
- 5** X/P/M Enhanced Accuracy, Platinum Mirror, Mylar Vapor Barrier
- 6** X/P/P Enhanced Accuracy, Platinum Mirror, Stainless Steel Vapor Barrier

Accuracy: S = Standard ($\pm 0.2^{\circ}\text{C}$) X = Enhanced ($\pm 0.15^{\circ}\text{C}$)

Mirror Type: R = Rhodium P = Platinum

Temperature Sensor

Sensor

- 0** No Temperature Sensor
- A** T-100 w/10 ft Cable (Standard Accuracy)
- B** T-100 w/10 ft Cable (Enhanced Accuracy)
- X** T-100 with build to fit cable (Standard Accuracy)
- Z** T-100 w/10 ft Cable (Enhanced Accuracy)

Pressure Sensors

- 0** No Pressure Sensor
- A** PT-30A 10 ft cable
- B** PT-30A build to fit cable
- X** PT-300A 10 ft cable
- Z** PT-300A build to fit cable

Order Code Example



For product selection assistance, please contact General Eastern's Application Engineering Group at **1-800-33-HUMID** or visit **www.generaleastern.com** for a complete listing of worldwide sales offices.

GE General Eastern Instruments

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GE Measurement & Sensing Technologies is an industry leader in the design and manufacture of precision temperature, humidity and pressure sensors, field calibrators and measurement instrumentation. With operations around the world, GE Measurement & Sensing Technologies develops technologies and solutions using thermal validation, dew point measurement, gas flow measurement, control circuit protection, hydrostatic pressure, and microstructure design for products and services in applications ranging from automotive and aerospace flight safety to subsea oil extraction, pharmaceutical and industrial manufacturing to medical apparatus, and other critical measurement applications such as water and gas distribution, power generation, etc.

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