

973 Dew Point Mirror



Portable Industrial Chilled Mirror Hygrometer

- Fundamental drift free humidity measurement
- Integral frost/dew point measuring head
- Internal sample pump
- Optimal Response Injection System for fast measurement
- Pressures up to 20 bar
- Integrated Stirling Cooling to extend working range
- Intuitive, easy to use LCD touch screen user interface

Typical applications:

- | | |
|---|--|
| <ul style="list-style-type: none"> - On-site calibration of dew point sensors - Checking breathing gas quality - Battery manufacturing - Compressed air systems | <ul style="list-style-type: none"> - Standards laboratories - Validation of production and storage conditions - Dryer performance tests |
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ISO/IEC 17025
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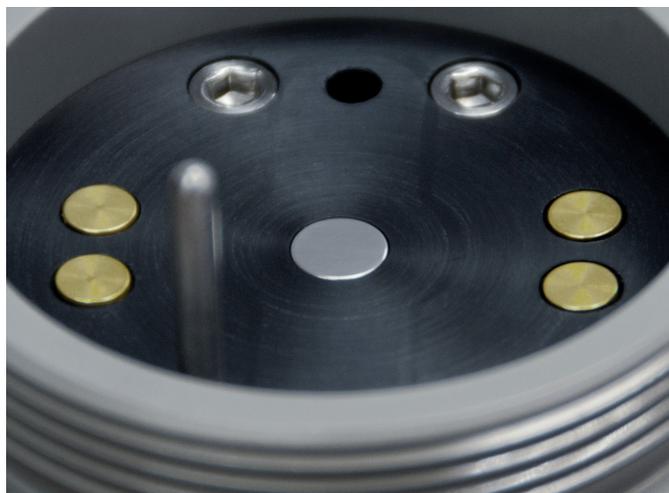
973 Dew Point Mirror

Fundamental Measuring Technique

The Model 973 Dew Point Mirror is a portable instrument equipped with an integral measuring head for both spot and continuous measurement of frost/dew point and temperature in air and gas. Based on the chilled mirror principle, the 973 provides fundamental, drift free and precise humidity measurement.

Simple to Use and Minimal Maintenance

The 973 has no need for either humidity sensor replacement or calibration adjustment. Unlike sensor-based systems, routine maintenance is conveniently limited to occasional mirror cleaning. Users can self-check instrument calibration stability using the integrated Ice-Test function.

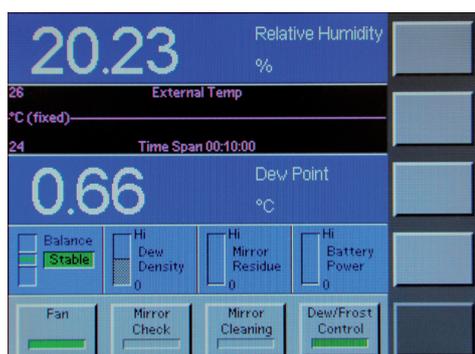
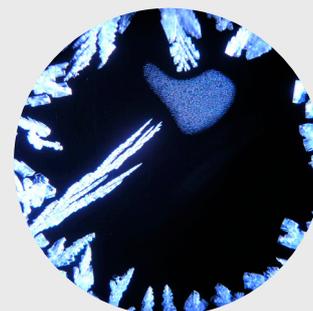


Dew or Frost?

Below 0 °C, water can condense in either the liquid or solid phase (dew or frost). The difference in the temperature at which the condensate layer stabilizes can be up to 3 °C, therefore the condensate phase must be known for correct calculation or validation of parameters such as relative humidity. As shown on the picture to the right, it is also possible that dew and frost can exist concurrently on the mirror; this results in a non-stable value somewhere between the dew and frost point.

ForceFrost™ Function

Below a user defined temperature, the 973's ForceFrost function over cools the mirror to force the condensed layer to the solid phase. This eliminates the uncertainty of whether dew or frost point is measured.



Intuitive User Interface

The 973 features a 5.7" LCD touch screen with a high contrast ratio and wide viewing angle for clear and easy readability. Using the on screen buttons and menus, you can easily configure each line of the instrument display for a variety of humidity, temperature and pressure parameters that may be viewed in units of your choice. A touch of a button changes any parameter between large font numeric and graph format with configurable axes so that the user can easily view measurement trends and stability without the need for external data acquisition.

Convenient Calibration Check

Users can easily check the 973 system's stability at any time using the built-in Ice-Test function. This is an automated test procedure that allows the user to check that ice on the mirror

melts at 0 °C and therefore verify the stability of the mirror temperature measurement.

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Optimum Response Injection System: Accelerated Results

The Optimum Response Injection System (ORIS) is unique to MBW chilled mirror instruments. At low frost point conditions, the time to stabilize a condensate layer can be significant, sometimes as long as two hours for correct equilibrium.

ORIS reduces the stabilization time using a carefully programmed vapor injection procedure that accelerates the formation of a frost layer and then interfaces with the mirror control system to maintain stability. When the rate of sublimation and condensation is equal, the measurement system is truly in equilibrium, and the result precise.

Precise Temperature Measurement

The 973 includes a 4-wire platinum resistance thermometer (PRT) for temperature measurement and to enable precise calculation of relative humidity. The temperature probe supplied is connected by cable to the 973 back panel and can be positioned by the user at the optimum measurement point within the application. In the event that direct measurement of the application temperature is not available, values can be manually input via a touch screen to allow the calculation of relative humidity at the process or application temperature.

Integrated Pressure Measurement

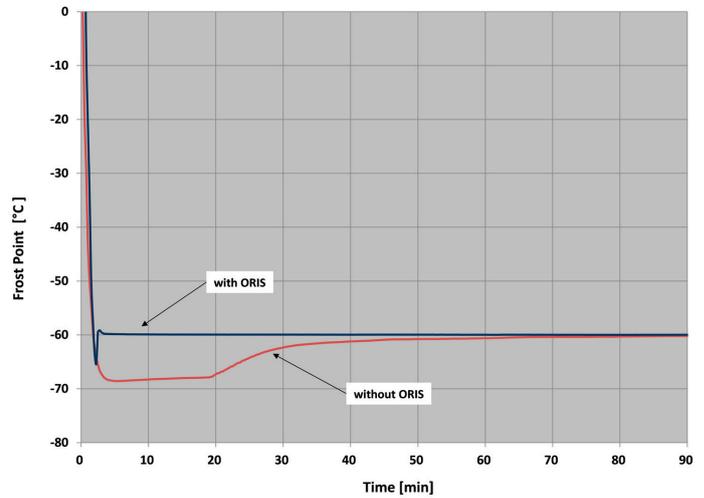
Integrated pressure measurement means that the 973 is able to compensate for pressure variations at the point of measurement resulting in the lowest possible uncertainties. The 10 and 20 bar pressure options are especially useful for compressed air systems, in-situ dew point sensor calibration checks, gas dryers and breathing gas applications.

Integrated Sampling System

An internal sample pump and flow meter is standard on the 973. This allows the user to connect the 973 to any application using sample tubes and pump a controlled flow of gas through the 973 measuring head, and if required, back to the application. This is especially useful for applications at atmospheric pressure where a reference instrument is used to validate conditions or calibrate fixed measurement sensors without the need for their removal from processes.

Extended Operating Range

At an ambient temperature of 20 °C, the 973 three-stage Peltier thermoelectric mirror cooling is capable of reaching -60 °C frost point. For optimum performance and to extend the working range to lower frost point values, versions with integrated measuring head pre-cooling are available.



Transportable

The 973 is self-contained and easy to transport around site or to different measurement locations.

A robust IP65 case is included as standard to protect the instrument during shipping for calibration.



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Specifications:	973S	973E	973CA	973L
Measuring Ranges				
Frost/Dew point:				
Working range	-60...20 °C	-60...20 °C	-60...20 °C	-75...20 °C
Calibrated range	-50...20 °C	-50...20 °C	-50...20 °C	-70...20 °C
Temperature	-50...100 °C			
Relative humidity	0.1...100 %rh			
Mixing ratio	100...20'000 ppm _v			1...20'000 ppm _v
Sample pressure	0...2.5 bar	0...10 bar	0...20 bar	0...20 bar
Accuracy				
Frost/Dew point (over calibrated range)	≤ ± 0.1 °C			
Temperature	≤ ± 0.07 °C			
%rh	≤ ± 0.5 %rh			
Pressure	≤ ± 0.1% range			
Reproducibility				
Frost/Dew point	≤ ± 0.05 °C			
Temperature	≤ ± 0.04 °C			
Standard Features				
Digital I/O	RS-232			
Display	5.7" LCD with color touch screen			
External temperature probe	PRT (Pt-100), Ø2 x 100 mm on 3 m cable			
Mirror temperature sensor	PRT (Pt-100)			
Mirror cooling	3-stage Peltier thermoelectric			
Pre cooling	Stirling CryoCooler on 973L			
Internal gas tubes	Stainless Steel 316L (inlet and outlet) FEP outlet with sample pump			
Gas inlet connections	6 mm or ¼" Swagelok fittings			
Internal sample pump*	Standard on 973S optional on 973E, 973CA, 973L			
ORIS	Optimum Response Injection System			
Transport case	Robust custom fit, foam lined, hard-shell case			
Power cable	2.5 m			
Operating instructions	English			
Calibration certificate	Factory calibration: 5 points FP/DP, 3 points temperature			
Optional				
Calibration upgrade	Upgrade to SCS accredited ISO 17025 calibration			
High pressure	10 or 20 bar internal pressure sensor			
Analog outputs	Two analog outputs, user programmable, -10...+10 V and 4...20 mA			
Additional water cooling	Extends frost/dew point range to -70 °C (water temp. 5 °C, ambient 20 °C)			
Transport case	Custom fit foam lined Pelicase			
Additional Information				
Supply voltage	100-120 VAC / 200-240 VAC, 50/60 Hz (auto switching)			
Power consumption	200 Watt			
Cooling	Air, additional water cooling optional. Stirling Cryocooler on 973L			
Operational conditions	10 °C...+40 °C, Maximum 98 %rh, non-condensing			
Storage temperature	-20 °C...+50 °C			
Weight & Dimensions	Instrument	In Transport Case		
Dimensions (W x H x D)	420 x 155 x 390 mm	627 x 303 x 497 mm		
Weight	10kg / 14 kg (973L)	21kg / 26 kg (973L)		

MBW Calibration Ltd.
Seminarstrasse 55/57
CH-5430 Wettingen
Switzerland

Phone +41 56 552 18 00

www.mbw.ch
sales@mbw.ch



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* If the internal sample pump optional is included, the maximum sample pressure must be no more than 3 bar or the pump will be damaged.

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Ordering Information

	Order Code
973S -60...20 °C FP/DP (incl. ø2 x 100 mm PRT on 3 m cable and internal sample pump)	100055
973E -60...20 °C FP/DP (low cost version, 10bar maximum)	105083
973CA -60...20 °C FP/DP (compressed air version, 20bar maximum)	105082
973L -75...20 °C FP/DP (integrated Stirling Cryocooler)	141568
Options	
973-Upgrade to SCS accredited calibration (ISO17025)	103847
10 bar pressure upgrade (no sample pump)	103635
20 bar pressure upgrade (no sample pump)	104021
Two analog outputs, user programmable, -10...+10 V and 4...20 mA	102662
Internal sample pump (for 973E, 973CA, 973L)	105087
Additional water cooling 973	103362
Additional 1 year warranty upgrade (max. 3 years)	103632
For the complete range of options and accessories, please contact us and request a pricelist.	

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CH-5430 Wettingen
Switzerland

Phone +41 56 552 18 00

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