

# 473 Dew Point Hygrometer



## High Performance Chilled Mirror Hygrometer With Cable Mounted Measuring Heads

- Highly precise chilled mirror dew point technology
- Cable mounted dew point and temperature measurement
- Aspirated and direct insertion measuring heads
- Barometric pressure measurement options
- Intuitive color touch screen user interface
- User verifiable calibration

### Typical applications:

- Climatic chamber validation to IEC60068
- Weather station calibration
- RH generator transfer standard
- Engine test cells



ISO/IEC 17025  
ACCREDITED  
SCS 0125

# 473 Dew Point Hygrometer



## Highly Precise Chilled Mirror Dew Point Technology

Chilled mirror condensation technology provides highly precise, stable and repeatable results. Water vapor condenses onto a temperature controlled mirror surface and this 'dew point' is detected with advanced optical electronics. Since dew point is specific to water vapor concentration and not temperature dependent, measurement precision is consistent across the full application range including high temperature and humidity conditions in climatic test chambers.

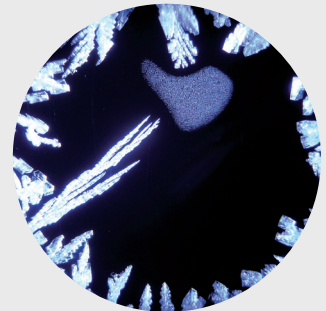
MBW chilled mirror hygrometers have a typical service life of more than 15 years thanks to the use of high quality materials and Swiss precision engineering. The high quality platinum resistance thermometer (PRT) element embedded within the mirror ensures excellent long term measurement stability. Thanks to the precise dew point and temperature measurements as well as the stability and long service life, MBW chilled mirrors are used by national standards and accredited laboratories worldwide. The 473 transfers reference standard performance into applications such as climatic chamber validation, relative humidity calibrators and a wide range of industrial processes.

### 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.

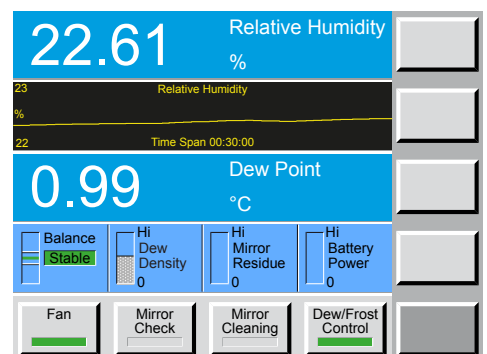
### ForceFrost™ Function

Below a user defined temperature, the 473'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 473 features a 5.7" color touch screen with a high contrast ratio and wide viewing angle for clear and easy readability. Using the on-screen buttons and menus, each line of the instrument display can be configured for a variety of humidity, temperature and pressure parameters that may be viewed in the units of choice. These parameters can be displayed either numerically or graphically with user-configurable axes enabling measurement trends and stability to be confirmed without the need for external data acquisition or display hardware.



### Easy To Use and Minimal Maintenance

The 473 does not require either calibration adjustment or sensor replacement. Maintenance is limited to periodic mirror cleaning. The automatic mirror check feature can be user programmed to regularly check for surface contaminants.

### Convenient Calibration Check

Users can easily check the 473 system's stability at any time using the built-in Ice-Test function. This automated test procedure allows the user to confirm that ice on the mirror melts at 0 °C to verify the accuracy and stability of the mirror temperature measurement system.

# 473 Dew Point Hygrometer

## Flexible Measurement Options

The 473 is available with different measuring heads together with temperature and pressure sensor options to meet the requirements of a wide range of applications.

### RP2 Measuring Head

The RP2 dew point measuring head has a two-stage Peltier element in a compact probe format and includes a connection for temperature measurement. It is supplied with a calibrated head mounted temperature probe and an extension cable to enable optimum placement in working volumes.

RP2 is suitable for direct insertion into applications with moving air such as relative humidity generators, climatic chambers, manufacturing processes and air ducts.

### SH2 Measuring Head

The SH2 is a flow-through dew point measuring head with a two-stage Peltier element for mirror temperature control. It includes a variable speed fan that pulls a consistent airflow across the mirror. Alternatively, with the fan removed, the SH2 head can also connect to applications using tubing and standard 6 mm or ¼" fittings. It is also supplied with a calibrated temperature probe with 0.5 m and 3 m cables for connection to either the measuring head or the 473 back panel.

Typical SH2 applications include climatic chamber validation, humidity generators, engine test cells and on-site calibration projects.

## Precise Temperature Measurement

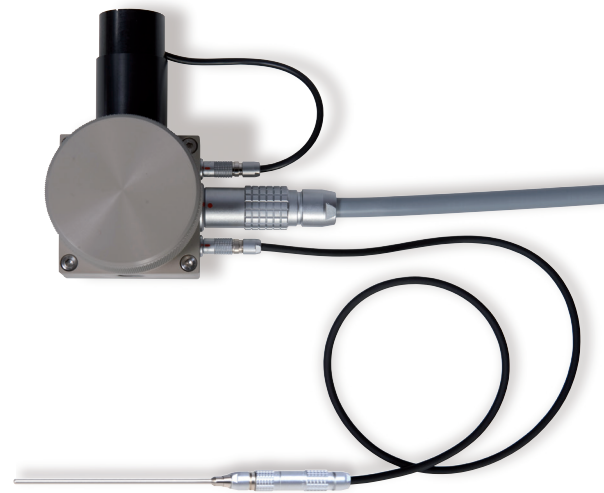
The 473 is supplied with a 4-wire PT-100 platinum resistance thermometer (PRT) for precise temperature measurement and to enable calculation of relative humidity. The temperature probe supplied can be connected directly to the measuring head, or by cable to the 473 back panel. Wider temperature measurement ranges and alternative probe configurations are available on request.

## Integrated Pressure Measurement

The internal pressure measurement option enables the 473 to compensate for pressure variations at the point of measurement resulting in the lowest possible uncertainties. A pressure measurement accuracy of 0.1 or 0.01% can be specified. The combination of precise dew point, temperature and pressure measurement makes the 473 suitable for use as a transfer standard for all three parameters. The pressure sensor is fitted inside the 473 housing with a 3 mm gas connection on the back panel.

## Transportable

The 473 is supplied complete with a robust IP65 case to ensure that the instrument can be transported safely to site for validation projects or shipped for calibration without risk of damage. The custom foam insert provides storage space for additional measuring heads, cables, manuals and calibration certificates.



# 473 Dew Point Hygrometer

Specifications:	473-RP2 *	473-SH2
<b>Measuring Ranges</b>		
Frost/Dew Point	-20...70 °C	-20...70 °C
Relative humidity	5...99 %rh **	5...99 %rh **
Temperature (head mount PRT)	-20...80 °C	-20...80 °C
Temperature (cable mount PRT)	-50...100 °C	-50...100 °C
<b>Accuracy</b>		
Frost/Dew point	≤ ± 0.15 °C	≤ ± 0.1 °C
Temperature	≤ ± 0.07 °C	≤ ± 0.07 °C
<b>Reproducibility</b>		
Frost/Dew point	≤ ± 0.07 °C	≤ ± 0.05 °C
Temperature	≤ ± 0.05 °C	≤ ± 0.05 °C
<b>Standard Features</b>	RP2: ø3 x 30 mm PRT, 0.5 m cable    SH2: ø2 x 100 mm PRT, 0.5 and 3 m cables Digital I/O    RS-232 Display    5.7" LCD with color touch screen Mirror temperature sensor    Platinum Resistance Thermometer (Pt-100) Gas connections    6 mm or ¼" Swagelok (SH2 only) Transport case    Custom fit foam lined Peli 1550 Power cable    2.5 m Operating instructions    English Calibration certificate    Factory calibration: 5 points FP/DP, 3 points temperature	
<b>Optional</b>	Internal barometric pressure sensor    0.1% or 0.01% accuracy, 700...1200 mbar Analog outputs    Two user programmable, -10...+10 V and 4...20 mA Calibration upgrade    Upgrade to SCS accredited ISO 17025 calibration	
<b>Additional Information</b>	Power supply    100...120 VAC / 200...240 VAC, 50/60 Hz, 100 Watt (auto switching) Operating conditions: Instrument    0...40 °C, 90 %rh non-condensing Measuring head    -50...80 °C, 99 %rh non-condensing Storage conditions    -20...50 °C	
<b>Weight &amp; Dimensions</b>	<b>Instrument</b>	<b>In Transport Case</b>
Dimensions	W310 x H155 x D265 mm	W510 x H220 x D450 mm
Weight	5 kg	12 kg
Protection	IP20	IP65

473 V2.4 08.2018 We reserve the right to change design or technical data without notice.

- \* The RP2 measuring head is only suitable for use in applications with moving air.
- \*\* Please note the operating conditions: The measuring head as well as the connectors must be operated under non-condensing conditions.

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# 473 Dew Point Hygrometer

## Ordering Information

Description:	Order code
473, -20...70 °C FP/DP with SH2 measuring head on 2 m cable (inkl. Ø2 x 100 mm PRT with 0.5 and 3 m cables and transport case)	105003
473, -20...70 °C FP/DP with RP2 measuring head on 2 m cable, (inkl. Ø3 x 30 mm PRT with 0.5 m cable and transport case)	105004
Options:	
473-Upgrade to SCS accredited calibration (ISO 17025)	103846
Two analog outputs, user programmable, -10...+10 V and 4...20 mA	102662
Internal barometric pressure sensor, 0.1% accuracy	100282
Internal barometric pressure sensor, 0.01% accuracy	103954
Additional 1 year warranty upgrade (maximum 3 years)	103632
For a complete range of options and accessories, please contact us and request our pricelist.	

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## 473-SHX Dew Point Mirror



### Humidity and Temperature Reference Hygrometer For Temperature up to 125 °C

- Precise and stable chilled mirror dew point mirror technology
- High temperature optical components
- High temperature sample fan
- Cable mounted dew point measuring head
- Barometric pressure measurement option
- Intuitive color touch screen user interface
- Integral calibration stability verification

#### Typical applications:

- Climatic chamber validation
- Calibration of climatic chambers
- HALT/HASS test chambers
- Fuel cell test



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# 473-SHX Dew Point Mirror



## Highly Precise Chilled Mirror Dew Point Technology

Chilled mirror condensation technology provides highly precise, stable and repeatable measurement of humidity. Water vapor condenses onto a temperature controlled mirror surface and this 'dew point' is detected with advanced optical electronics. As dew point is specific to water vapor concentration and not temperature dependent, measurement performance is precise across the full application range including high temperature and humidity conditions in climatic test environments.

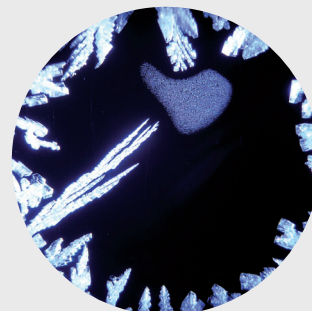
MBW chilled mirror hygrometers have a typical life of more than 15 years thanks to the use of high quality components and typical Swiss precision engineering. The high quality platinum resistance thermometer (PRT) element integrated within the dew point mirror maintains the best possible long term measurement stability. MBW chilled mirrors are used by national standards and accredited laboratories worldwide, and with the advent of the 473-SHX, standards laboratory performance is now possible in industrial applications up to 125 °C.

### 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.

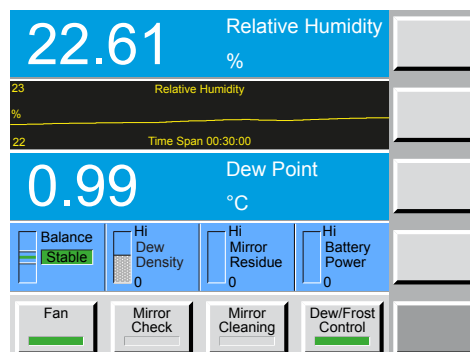
### ForceFrost™ Function

Below a user defined temperature, the 473's ForceFrost function overcools 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 473 features a 5.7" color touch screen with a high contrast ratio and wide viewing angle for clear and easy readability. Using the on-screen buttons and menus, each line of the instrument display can be configured for a variety of humidity, temperature and pressure parameters that may be viewed in the units of choice. These parameters can be displayed either numerically or graphically with user-configurable axes enabling measurement trends and stability to be confirmed without the need for external data acquisition or display hardware.



### Easy To Use and Minimal Maintenance

The 473 does not require either calibration adjustment or sensor replacement. Maintenance is limited to periodic mirror cleaning. The automatic mirror check feature can be user programmed to regularly check for surface contaminants.

### Convenient Calibration Check

Users can easily check the 473 system's stability at any time using the built-in Ice-Test function. This automated test procedure allows the user to confirm that ice on the mirror melts at 0 °C to verify the accuracy and stability of the mirror temperature measurement system.

# 473-SHX Dew Point Mirror

## SHX High Temperature Measuring Head

The SHX measuring head is an evolution of the tried and tested SH measuring head. It is able to operate in test conditions up to 125 °C thanks to the use of optical components, electronics and materials that are able to withstand high temperatures. Our development team tested a range of components over the SHX working range to achieve the best possible performance. By comparison with our state-of-the-art 373 reference hygrometer, we were able to verify that the performance meets or exceeds the specifications.

## Sample Flow Control at High Temperature

Precise dew point measurement depends on controlled and stable gas flow over the dew point mirror and known pressure. Flow rate is especially critical at high temperature and humidity conditions. The SHX measuring head incorporates a sample fan with user controllable speed that maintains a stable flow within the recommend range of 0.3...1 litre per minute at atmospheric pressure. A high temperature motor is combined with a micro engineered aluminium impeller/cowl combination to maintain reliable and stable sample flow. Flow rate can be changed through the 473 front panel user interface or by serial commands.



## Modular Design

The key components of the SHX such as the optical module and fan assembly can be easily replaced by the user without the need for system recalibration.

## Precise Temperature Measurement

The 473 is supplied with a 4-wire PT-100 platinum resistance thermometer (mini PRT) for precise temperature measurement and to enable calculation of relative humidity. The temperature 3 x 30 mm Ø probe with a 1 m cable can be connected directly to the measuring head, or (as an option) by cable to the 473 back panel. Wider temperature measurement ranges and alternative probe configurations are available on special request.

## Integrated Pressure Measurement

The 473 barometric pressure measurement option enables the user to compensate for pressure variations at the point of measurement to achieve the lowest possible uncertainties. A pressure measurement accuracy of 0.1 or 0.01% can be specified. The combination of precise dew point, temperature and pressure measurement makes the 473 suitable for use as a transfer standard for all three parameters. The pressure sensor is fitted inside the 473 housing with a 3 mm gas connection on the back panel. On request, the pressure sensor can be externally mounted so that it can be mounted close to the SHX measuring head. It is also possible to specify the 473-SHX with a wider range of pressure measurement.

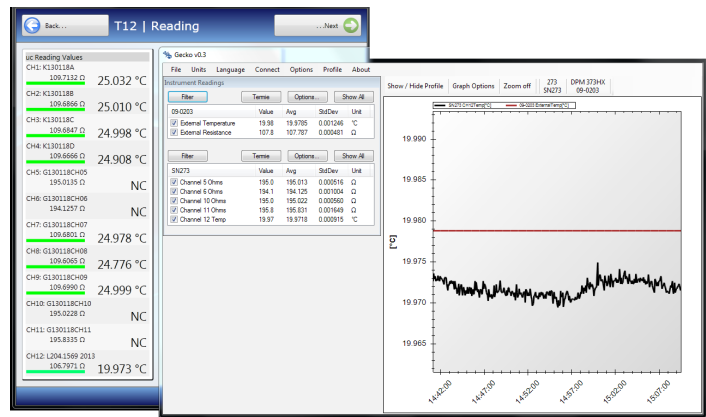
## Transportable

The 473 is supplied complete with a robust IP65 transport case to ensure that the instrument can be transported safely to site for validation projects or shipped for calibration without risk of damage. The custom foam insert provides storage space for additional measuring heads, cables, manuals and calibration certificates.





# 473-SHX Dew Point Mirror



## Gecko Software

MBW provides Gecko software free of charge to all users. Gecko allows the measurement data from the 473 or any other MBW instrument to be read via RS232/USB by a PC. Gecko automatically saves all measurement data, and can also be configured to the users preferred logging interval and filename.

## T12 Compatible

The MBW T12 is a 12 channel PRT interface with high accuracy and stability. The T12 has been developed to provide a high performance solution for temperature uniformity assessment, and through Gecko software, users can combine the data. This means that chamber validation for humidity and temperature can be carried out with a single system.



## RH Uniformity

473-SHX dew point and T12 temperature data can be combined within Gecko to calculate RH uniformity within any test chamber. This chamber validation function combined with the wide operating range of the 473-SHX means that high performance validation capability is accessible outside of the laboratory.

## 473-T12 Validation Sets

As with the other 473 instruments, a series of sets are available to suit typical application requirements. These sets provide engineers with a complete solution to perform system validations in scenarios such as climatic chambers, RH generators and other controlled humidity conditions. The Sets are delivered fully calibrated with all cables and software provided, and are ready for immediate use.

### Example 473-T12 Sets

#### High Temperature Chamber Validation Set

473-SHX-T12-10  
473-SHX, T12, 10 PRTs, Gecko software, system calibration, transport case.

#### Chamber Validation Set

473-SH2-T12-10  
473-SH2, T12, 10 PRTs, Gecko software, system calibration, transport case.

#### RH Generator Validation Set - Basic

473-RP2-T3  
473-RP2 with three external PRTs, Gecko software, system calibration, transport case

# 473-SHX Dew Point Mirror

Specifications:	473-SHX	
<b>Measuring Range</b>		
Frost/Dew Point	-30...+99 °C	
Relative humidity	5...99 %rh *	
Temperature	-50...+125 °C	
<b>Accuracy</b>		
Frost/Dew point	≤ ± 0.1 °C	
Temperature	≤ ± 0.07 °C	
<b>Reproducibility</b>		
Frost/Dew point	≤ ± 0.05 °C	
Temperature	≤ ± 0.03 °C	
<b>Standard Features</b>		
Measuring head	Cable mounted, with high temperature optics and sample flow module	
Optical module	User replaceable, high temperature optics	
Mirror temperature sensor	Platinum Resistance Thermometer (Pt-100)	
Mirror temperature control	2 stage Peltier, 50 °C depression at 20 °C	
Temperature probe	Ø 3 x 40 mm PRT (Pt-100 4 wire) 1.0 m cable to measuring head	
Head mounted sample flow fan	High temperature, variable speed	
Sample gas connections	Inlet/Outlet 6 mm or ¼" Swagelok	
Sample gas flow	0.3...1 l/min	
Digital I/O	RS-232	
Display	5.7" LCD with color touch screen	
Power	External 24 VDC power supply (included), 2.5m cable	
Transport case	Custom fit foam lined Peli 1550	
Operating instructions	English	
Calibration certificate	Factory calibration: 5 points FP/DP, 3 points temperature	
<b>Optional</b>		
Internal barometric pressure sensor	0.1% or 0.01% accuracy, 700...1200 mbar	
Analog outputs	Two user programmable, -10...+10 V and 4...20 mA	
Calibration upgrade	Upgrade to SCS accredited ISO 17025 calibration	
<b>Additional Information</b>		
Power supply	100...120 VAC / 200...240 VAC, 50/60 Hz, 100 Watt (auto switching)	
Operating conditions:		
Instrument	0...+40 °C, 90 %rh non-condensing	
Measuring head	-40...+125 °C, 99 %rh non-condensing	
Storage conditions	-20...+50 °C	
<b>Weight &amp; Dimensions</b>	<b>Instrument</b>	<b>In Transport Case</b>
Dimensions	W420 x H155 x D390 mm	W510 x H220 x D450 mm
Weight	8 kg	13 kg
Protection	IP20	IP65

MBW\_473-SHX\_Datasheet\_EN\_V1.3 (08.2018)

We reserve the right to change design or technical data without notice.

\* Please note the operating conditions: The measuring head as well as the connectors must be operated under non-condensing conditions.

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# 473-SHX Dew Point Mirror

## Ordering Information

Description:	Order code
473, -30...99 °C FP/DP with SHX measuring head on 2 m cable (incl. Ø3 x 30 mm PRT with 1 m cable and transport case)	141216
<b>Options:</b>	
473-Upgrade to SCS accredited calibration (ISO 17025)	103846
Two analog outputs, user programmable, -10...+10 V and 4...20 mA	102662
Internal barometric pressure sensor, 0.1% accuracy	100282
Internal barometric pressure sensor, 0.01% accuracy	103954
Additional 1 year warranty upgrade (maximum 3 years)	103632
For a complete range of options and accessories, please contact us and request our pricelist.	

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