Operating Instructions for the

THERMO HYGROMETER

TYPE DTH-1020

How to use the
THERMO HYGROMETER TYPE DTH-1020

General:

The DTH-1020 is an electronic thermo hygrometer displaying the room temperature and the relative humidity.

It is an ideal tool that will help you maintain a cosy and healthy interior climate by heating and airing intelligently during the heating period while minimising the energy consumption.

Using integrated electrical sensors responding much faster than mechanical devices, the thermo hygrometer measures and displays the temperature and the humidity permanently. In this way, deviations from the normal cosiness level can be corrected immediately by heating or airing, which prevents humidity induced damage such as mould stains and mildew caused by too high a humidity.

Airing on wet and cold winter days?

To recommend that you air on a cold winter day when it's raining, snowing or there's fog seems to be absurd but the term relative humidity indicates that the humidity or steam content of the air depends on the temperature. The dense fog outside is cold, and cold air is capable of absorbing only little humidity or cannot absorb any humidity at all. But when this air comes into your home, it is warmed up and can absorb great amounts of water steam. After only a few minutes of shock airing, you can watch the relative humidity drop rapidly on the digital display of the DTH-1020!

The following table illustrates the interdependence between the air temperature and the maximum amount of water the air can absorb, based on the assumption of approx. 100 grams of water in 50 m³ of air. The warmer the air, the more water it can absorb and hold:

Air temperature	Maximum amount of water	Relative humidity
- 7°C	110 grams of water	100%
0°C	220 grams of water	100%
+10°C	440 grams of water	100%
+15°C	500 grams of water	100%
+20°C	850 grams of water	100%
+23°C	1000 grams of water	100%

As you can see: On a cold winter's day at -7°C, air can absorb a maximum of 110 grams of water. When this air comes into your home by airing and is heated to +23°C, it can absorb more than nine times as much water steam.

Heating the street?

Many people fear that throwing open new, air-tight windows with insulated glass panes and shock airing now and then would imply heating the street. This recommendation will confuse the energy conscious because it seems to contradict common-sense energy saving rules.

In this context, it is often ignored that to replace the room air by shock airing usually takes only 10 – 15 minutes. Although the air in the room may turn somewhat nippy, heat is still stored in the walls. Only a few minutes later, the room air temperature is back to the value it had before airing – thanks to the walls'

storage capacity. This effect can also be observed on the temperature display of the Thermo Hygrometer DTH-1020.

The now dry room air can be kept cosy with much less heating energy than the humid air before. You can use a much heating energy as you like and still will not be able to make your home cosy if the air is humid.

In other words: Saving energy means that shock airing now and then is necessary, not permanent airing. How often, for how long? This is indicated by measured values displayed by the DTH-1020

If the room air had a relative humidity of 75% for example, and the display reads 35% r. h after 5 minutes of shock airing, it would be infeasible to continue airing.

Airing by leaving a tilt-and-turn window ajar is inappropriate because a real air exchange will not take place. The window lintel will cool down, and humid air condensing on its cold surface will promote the formation of mould stains and mildew.

Heating by keeping doors open?

The warmer the air, the more water steam it can absorb. Warm air cooling down will raise the relative humidity to the saturation level (100% r. h.). Further cooling down will cause the superfluous water steam to condense and form droplets. This temperature is called the dew point. With the dew point table below and the measured values displayed by the DTH-1020, you can easily determine the dew point of the room air:

Dew Point Table
Dew point temperature in °C at a relative humidity of

| Air Temperature °C	30 %	35 %	40 %	45 %	50 %	55 %	60 %	65 %	70 %	75 %	80 %	85 %	90 %	95 %
26°	7,1	9,4	11,4	13,2	14,8	16,3	17,6	18,9	20,1	21,2	22,3	23,3	24,2	25,1
25°	6,2	8,5	10,5	12,2	13,9	15,3	16,7	18	19,1	20,3	21,3	22,3	23,2	24,1
24°	5,4	7,6	9,6	11,3	12,9	14,4	15,8	17	18,1	19,3	20,3	21,3	22,3	23,1
23°	4,5	6,7	8,7	10,4	12	13,5	14,8	16,1	17,2	18,3	19,4	20,3	21,3	22,2
22°	3,6	5,9	7,8	9,5	11,1	12,5	13,9	15,1	16,3	17,4	18,4	19,4	20,3	21,2
21°	2,8	5	6,9	8,6	10,2	11,6	12,9	14,2	15,3	16,4	17,4	18,4	19,3	20,2
20°	1,9	4,1	6	7,7	9,3	10,7	12	13,2	14,3	15,4	16,4	17,4	18,3	19,2
19°	1	3,2	5,1	6,8	8,3	9,8	11,1	12,3	13,4	14,5	15,5	16,4	17,3	18,2
18°	0,2	2,3	4,2	5,9	7,4	8,8	10,1	11,3	12,5	13,5	14,5	15,4	16,3	17,2
17°	-0,6	1,4	3,3	5	6,5	7,9	9,2	10,4	11,5	12,5	13,5	14,5	15,3	16,2
16°	-1,4	0,5	2,4	4,1	5,6	7	8,2	9,4	10,5	11,6	12,6	13,5	14,4	15,2
15°	-2,2	-0,3	1,5	3,2	4,7	6,1	7,3	8,5	9,6	10,6	11,6	12,5	13,4	14,2
14°	-2,9	-1	0,6	2,3	3,7	5,1	6,4	7,5	8,6	9,6	10,6	11,5	12,4	13,2
13°	-3,7	-1,9	-0,1	1,3	2,8	4,2	5,5	6,6	7,7	8,7	9,6	10,5	11,4	12,2
12°	-4,5	-2,6	-1	0,4	1,9	3,2	4,5	5,7	6,7	7,7	8,7	9,6	10,4	11,2

If the air temperature display reads 22 °C and the r. h. is 70%, for example, the respective table cell gives a dew point temperature of 16.3 °C. This means: the air in question (measured in the living room, for example) will condense in all places colder than 16.3 °C. This could be a bottle of beer right from the refrigerator, but also a cold, unheated wall, for example in the bedroom that is exposed to the warm, humid air because the doors were open. The dew point is reached there, and droplets form that sooner or later will cause mould stains and mildew.

If the content of humidity in the air were only 45% for example, its dew point would be 9.5°C according to the table. The walls would have to be much colder than in the previous case (i.e. a surface temperature colder than 9.5°C) for the air to reach its dew point and to form condensation.

If you turn off the heating completely, for example in the morning when you leave for work, the walls will cool down after some hours. Turning the heating on in the evening (or even at noon) will cause the room air temperature to rise quickly whereas the walls will remain cold for hours to come. As a consequence, breathing air, kitchen or shower vapours will condense on the cold walls.

A better solution is to keep the heating on at a low level to prevent the walls from cooling down. This, by the way, is more energy-efficient than turning the heating off and on completely (like with stop and go in a traffic jam).

As the measured values of the DTH-1020 Thermo Hygrometer keep you informed at all times, you can optimise your room climate by appropriately airing and heating during the cold season. This saves heating energy and prevents damage due to humidity.
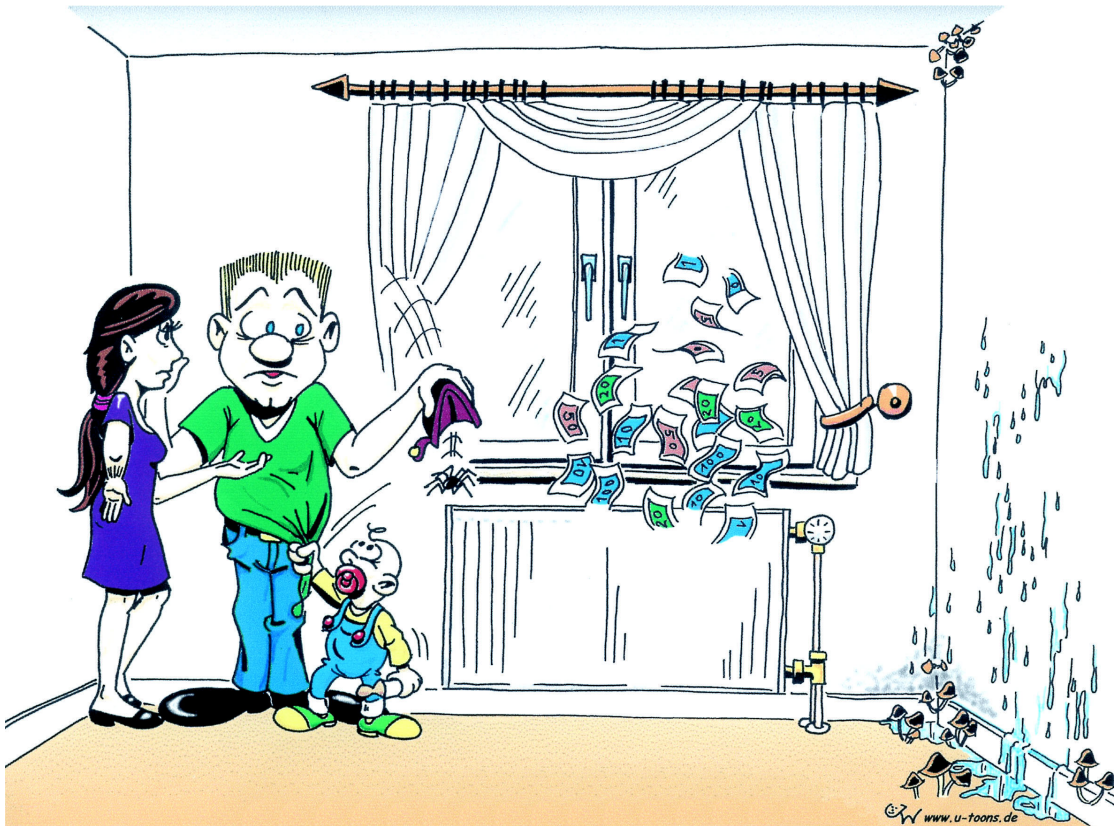
How much heating energy can you save by controlled airing?

Air of 22 °C and 45% relative humidity has a heat contents (enthalpy) of 40.9 kj/kg (kilo joule per kilogram). The heat contents at 70% r. h. is 51.6 kj/kg, at 80% r. h. 55.9 kj/kg, and at 90% r. h. 60.3 kj/kg.

In other words, approx. 26% additional heating energy is required to maintain a room temperature of 22 °C if the relative humidity rises to 70%. At a relative humidity of 80%, you need 37%, and at 90% r. h. even 47% more heating energy than at 45% r. h. 16% more heating energy is required even if the relative humidity only rises to 60%.

This physical correlation is totally independent of the constructive properties of a building.

How to read the measured values

The upper row of the digital display indicates the measured value for temperature in degrees Celsius, the lower row the relative humidity in percent.

Although the integrated sensors record changes in the room climate very quickly, the new values are displayed after a delay. This means that breathing on the meter will not cause the displayed values to change immediately: To keep the battery consumption at a low level, the measured values are polled and displayed at an interval of approx. 10 seconds only. In practice, this is totally sufficient because the room climate never changes abruptly.
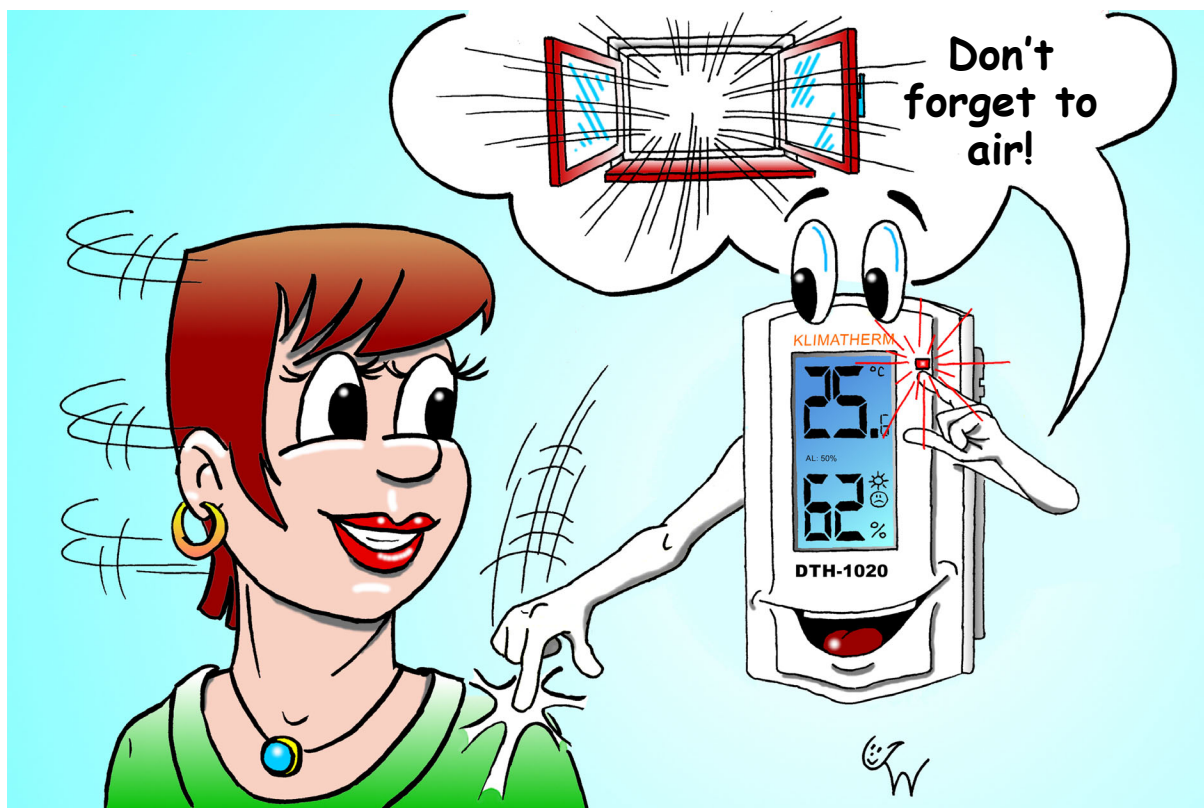
Function of the red LED

In addition to the temperature and humidity display, there is a red LED at the front of the DTH-1020. In the winter mode, it will flash if the relative humidity of the room air exceeds 50%, 55% or 60%. Even without watching the display, the flashing LED reminds you to air the room to prevent condensation on the wall. But above all, you will reduce your heating costs because more energy is needed to heat up humid air. The LED will stop flashing if the relative humidity drops below 50%, 55% or 60%. You can set an alarm level of 50%, 55% or 60% at the rear of the meter; this will be displayed accordingly (e.g.: AL: 55%).

There is a push button at the rear to disable the LED function, for example in the warm period, when very humid air will not condense because the walls are not cold (except for in the basement): When set to "Winterzeit (winter)", the LED is enabled, when set to "Sommerzeit (summer)", the function is disabled. We recommend that you simply set the DTH-1020 to the respective mode with the push button when you change from summer to winter saving time or vice versa. The display indicates a sun symbol for summer time, or a snowflake symbol for winter time

Ideal climate

The following approximate values will result in an ideal interior climate:

Approx. 40% to 55% relative humidity, and approx. 19 °C to 22 °C room temperature. Of course there is hardly any way of controlling the high relative humidity in your home in summer when it is hot and muggy. But this humidity usually will not cause any damage because the walls are also warm now. If at all, this humid air will condense on cold pipes or other cold spots when it reaches the basement.

Setting/hanging up the meter

There is a round opening at the rear of the thermo hygrometer to hang it up on the wall. To set up the meter, there is a clip stand that swings out at the bottom rear.

Start-up and battery change

The battery compartment is below the clip stand at the rear. Simply open the cover by pushing it down in direction of the arrow. To insert, push the supplied battery against the spring slightly while heeding the polarity. The plus pole (+) must point to the right, minus (-) to the spring.

When you insert the battery, a segment test is performed and the LED flashes once before the DTH-1020 switches to the normal display mode.

You should replace the battery (use an "AAA" 1.5 Volt battery) if the red LED fails to flash (in winter mode) if the alarm level is exceeded or the LC display becomes too dim.

A new battery will last for approx. 12-15 months of operation.

Make sure to dispose of waste batteries properly. Waste batteries are special waste and have to be disposed of in dedicated collecting boxes.

Electronic devices must not be disposed of as household waste; please drop them off at respective recycling and collection stations.
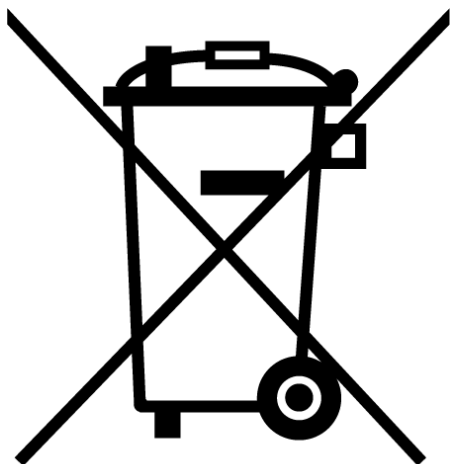
Measuring ranges and accuracy

The measuring range for relative humidity is 0% to 95%, the accuracy in the range of 50% to 80% is ±3%, otherwise ±5%. The measuring range for temperature is 0 °C to 50 °C, the accuracy is ±1 °C over the entire measuring range.

Caution!

Air humidity below 30% and above 95% r. h. and temperatures below 0 °C and above 50 °C cannot be measured with the DTH-1020 Thermo Hygrometer.

Details about the measuring accuracy
How accurate is the humidity measurement with the DTH-1020?

The accuracy of humidity measurement in the range of 50% to 80% is ±3%, otherwise ±5%. At a relative humidity of 35%, one meter could display 31% for example, while another one displays 39%. Both meters are still within the tolerance range in this extreme case.

But comparing meters with each other or with a test instrument is possible only in a climate cabinet. Comparisons made outside of a climate cabinet in a climate currently prevailing at a given location are unreliable or insignificant due to diverse influences (air layers, air movement, etc.).

Technical data for type DHT-1020

Large, easy to read LCD.
Humidity measuring range: 30% to 95% r. h.,
Temperature range: 0 °C to 50 °C
Accuracy of humidity measurement:
            ±3% in the range between 50 and 80% r. h.,
            otherwise ±5%
Accuracy of temperature measurement:
            ±1 °C over the entire measuring range
Operation: 1.5 Volt battery
Dimensions: 70 x 130 x 18 mm (w x h x d)
Weight: 100 grams incl. battery