ORDER CODE **30019830**

HYDROMETTE®
BL COMPACT TF 3

The BL Compact TF 3 unit is a **precise thermo hygrometer** for measuring temperature and relative air humidity **in many applications** (e.g. residential space, air conditioning, printing shops, warehouses, museums).
The measuring sensor is exchangeable. Several of these sensors (plug-in TF sticks) can be put in different places (environments). Thus, successive measurements in those places can be carried out more quickly, for long adaption times can be avoided (compared to a meter with a fixed sensor).

MEASURING RANGES

- **AIR HUMIDITY**
  0 to 100% R.H.
  ± 1.8% R.H. (10 to 90% R.H.) (*)
- **TEMPERATURE**
  -20 to +80 °C
  ± 0.3 °C (0 to +60 °C) (*)

(*) = sensor accuracy

PROPERTIES

- Automatic calculation of dew point temperature and equilibrium wood moisture content (EMC)
- Display of absolute air humidity in g/m³
- USB port for firmware updates using GANN Dialog pro
- Storage of the 5 most recent measured values
- 210 mm [L] - total lenght incl. the TF stick
- for special requirements, other TF sticks with different filter types are optionally available

TF sticks

HYDROMETTE®
BL COMPACT TF-IR 2

ORDER CODE **30012072**

The BL Compact TF-IR 2 unit has sensors for surface temperature infrared measurements as well as for measuring air temperature and relative air humidity.

This combination **of the different measuring techniques** enables the TF-IR 2 unit to be used for quickly and reliably **assessing dew point undershoots** or determining borderline conditions on **surfaces** such as walls, ceilings, floors as well as on window or door lintels. In addition to displaying the measured value, the unit creates an **audible signal when a critical surface temperature is detected**. When using the unit in due time, mould formation (fungal growth) may be prevented and occurrence of moistening caused by condensation may be assessed reliably.

For special requirements, other TF sticks with different filter types are optionally available.

MEASURING RANGES

- **AIR HUMIDITY**
  0 to 100% R.H.
  ± 1.8% R.H. (10 to 90% R.H.) (*)
- **TEMPERATURE**
  Air temperature:
  -20 to +80 °C
  ± 0.3 °C (0 to +60 °C) (*)
- **INFRARED MEASURING RANGE**
  -40 to +240 °C
  ± 0.5 °C (0 to 60 °C),
  at 0 to 50 °C ambient temperature (*)

(*) = sensor accuracy

PROPERTIES

- Built-in audible interval signal: The more the surface temperature is approaching the dew point temperature, the more the signal will change from intermittent to continuous sound
- Laser pointer for identifying the measuring spot
- 6:1 optical system
- Including dew point temperature and equilibrium wood moisture content (EMC)
- Emissivity adjustable from 20 to 100%
- USB port for firmware updates using GANN Dialog pro
- Storage of the 5 most recent measured values
- 210 mm [L] - total lenght incl. the TF stick




ABOUT
MEASURING ACCURACY

Assessing the accuracy of a meter or of a measuring process requires considerable knowledge and expertise. The following description and information is to assist you as the user in practice.
It is intended to help you to better get through the maze of terms and to better assess your measurements. For this, it is necessary to subdivide the term of "accuracy" into the individual portions.

The accuracy/precision of the measurement essentially depends on the following elements:

MEASURING CIRCUIT/BOARD AND COMPONENTS USED

The quality design of the electrical circuit and the board layout are some of the most important prerequisites to achieve the highest possible basic accuracy.

Shielding against external impact (electrostatics, radio-frequency irradiation etc) as well as a reliable temperature compensation are indispensable requirements.

High-quality and narrow-tolerance components are indispensable as well, e.g. an A/D converter (for converting analogue to digital signals) having 16 bit resolution is 256 times better than a comparable 8 bit resolution A/D converter.

BASIC ACCURACY OF THE METER

It is based on the circuit, precision of the components used as well as on the exact calibration/adjustment to one fixed value or several values of a calibration curve.

For given % values (e.g. ±2%), it is important to know whether these refer to the currently shown value or to the upper value of the measuring range.

The term "digit(s)" refers to a so-called "numerical step" (digital scale divisions) of a digital display.

For analogue gauges (pointer devices), the accuracy is commonly identified by "classes" (e.g. class 1 or class 1.6).

RESOLUTION OF THE ANALOGUE/DIGITAL DISPLAY

The term "resolution" is often mixed up with accuracy or used as a synonym. This is wrong. High resolution does not automatically result in high accuracy.

The term "resolution" that refers to an analogue or digital display only describes the number of readable digits (e.g. 000.00 = 5 digits) or more often the number of decimal places, commonly referred to as "reading accuracy". In this context, resolution is described using values (1 or 0.1 or 0.01) or digits (referring to the least significant digit).

REFERENCE/CALIBRATION STANDARD

In Germany, the supreme authority for calibration standards is the Physikalisch-Technische Bundesanstalt (PTB) in Brunswick. The PTB calibrates "standards" which are used by the DKD (Deutscher Kalibrierdienst) for calibrating meters and standards for factory calibrations. These in turn are used by the meter manufacturers for calibrating their units.

Such calibration standards/meters exist for the meters designed and manufactured by us for temperature measurement (for both mechanical sensors and for the units using infrared surface temperature measurement, also referred to as "pyrometers") and for air humidity measurement.

Thus, fixed specifications exist for these two application ranges, which means that the accuracy is therefore based on the grade of the sensors used and their exact adjustment.

For wood moisture measurement, there are no standard or other values specified by an officially recognised institution (exception: the calibration curve, based on the DIN 1052 standard, for spruce wood specified by the Materials Testing Institute of the University of Stuttgart (MPA Stuttgart, Otto-Graf-Institut) for the recognised glued laminated timber industry.

This also applies to measuring set building materials and a number of bulk materials (exception: certain types of grain, as far as these are commercially used for accounting purposes).

The term of "gauging" is actually reserved for the Gauging Office. "Gauging" refers to the calibration procedure performed by the Gauging Office. Basically, this only refers to equipment that is used for trading purposes, e.g. scales.

The calibration curves for the individual types of wood or building and insulating materials are created by reliable equipment manufacturers themselves. These curves are created using a complex procedure involving numerous series of measurement for each type of wood or each building or insulating material, based on the oven-dry test procedure. The calibration curves created that way are business secrets of a manufacturer.

QUALITY RATING OF THE SENSORS USED

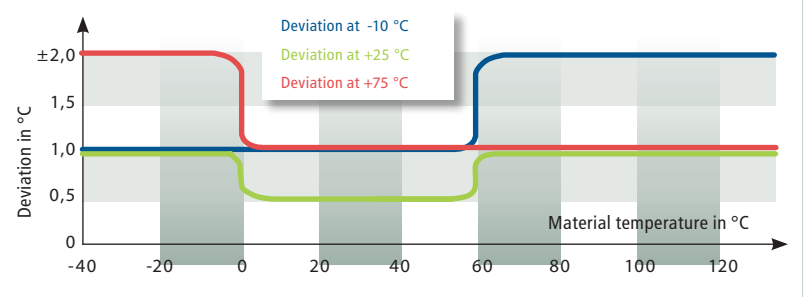
SENSORS FOR MEASURING TEMPERATURE

Temperatures are measured using a large variety

Temp.	Class A	Class B
-100 °C	0,35 °C	0,80 °C
0 °C	0,15 °C	0,30 °C
+100 °C	0,35 °C	0,80 °C
+200 °C	0,55 °C	1,30 °C

GRAPHIC A

Measuring accuracy for Pt100 sensors



GRAPHIC B

Measuring accuracy of infrared sensors at different ambient temperatures

of sensors. For measurement equipment of higher quality, temperature measurement of gas/air, liquids, bulk materials, and solids using platinum measuring resistors (e.g. Pt100 in 4-wire technology) has gained precedence. Of course, there are also different classes of accuracy (refer to graphic A).

More information on accuracy of Pt sensors is found on the web. For achieving acceptable measuring accuracy, at least class B sensors are required to be used.

For measuring surface temperatures on objects having high heat content and good thermal conductivity, also thermocouple sensors (cross- or dual-band sensors) are used. However, their accuracy in the range that is relevant to dew point measurements is not always sufficient.

All mechanical temperature sensors (contact thermometers) are reasonably used only in cases where the media to be measured have sufficiently high heat content and corresponding good thermal conductivity.

Insulating materials consisting of foamed plastics, wood or wooden materials, compound materials having different thermal conductivity (e.g. bonded wallpapers etc.) or materials having a rough or uneven surface, moving, or vibrating parts either cannot be measured using mechanical sensors, or the accuracy achieved is not sufficient.

For this purpose, infrared surface temperature measuring equipment providing good sensor accuracy is available today. Our equipment that is used in the classic application of climate monitoring in residential or business rooms includes such sensors. In particular, this applies to the assessment of damage caused by humidity (e.g. mould formation (fungal growth) by undershooting the dew point temperature). An accuracy of ±0.5 °C is very important for determining the dew point on wall surfaces (refer to graphic B). The higher the inaccuracy in this range, the higher the inaccuracy span for establishing the dew point undershoot temperature. Furthermore, entering the correct emissivity for the surface material to be measured is of high importance.

SENSORS FOR MEASURING AIR RELATIVE HUMIDITY

Accuracy and long-term stability of the sensors for gathering relative air humidity have been significantly improved within recent years. This is also true for measurements in contaminated air where the sensors have to be protected by appropriate filter systems. Sometimes, filters significantly extend response times, which contributes to inducing measuring errors if values are read too early. Also, adapting the temperature of the sensor to the ambient/air temperature is very important. Measuring systems of higher quality (e.g. for surveyors) have a typical accuracy of ±1.8% R.H and ±0.3 °C temperature (or better) (refer to graphic C).

ABOUT
MEASURING ACCURACY

To maintain this precision, such equipment should be checked for accuracy at the manufacturer or by an appropriate calibration laboratory every 12 to 24 months, depending on its application purpose and frequency.

When air humidity sensors are used for determining humidity by means of sorption isotherms in solids (e.g. concrete, screed, brickwork, etc), the sensor or the sensor assembly must have sufficient accuracy even when used to measure air humidity values of 95% R.H.

SENSORS FOR MEASURING WOOD MOISTURE

Precise wood moisture measurements are mostly based on the resistance measuring technique. For measuring, two steel pins are pushed or tapped into the wood to be measured. For our meters, the pins should be driven in perpendicularly to the fibre direction. Particularly for wet wood, this heavily affects accuracy.

Another aspect that concerns accuracy, is setting/entering/selecting the correct type of wood. Implementation of this aspect depends on the respective equipment manufacturer.

Medium-class equipment should have 4 or 7 wood species correction levels – high-class equipment should provide at least 75 options for wood species correction levels, if not even individual code numbers for each type of wood (from 250 numbers on). In the dry range, accuracy values of ±0.5% can be obtained.

For the different wood thicknesses, pins of 16, 23, 40, or 60 mm in length are available. For accurate measurement, these are to be driven in up to a third of the entire wood thickness. Moreover, Teflon insulated pins of 45 or 60 mm in length are available. Using these pins, individual layers or wood surfaces wetted by rain or dew can reliably be measured.

Another popular option is measuring wood moisture using a capacitive sensor. These units are also referred to as put-on units. Most of them have area or spring sensors. Area sensors require a relatively large and in any case plane contact area (planed surface). This also applies to units having wide spring structures. Compared to these, the ball-shaped sensor used in our units has application benefits. With regard to accuracy, larger measured value deviations are to be expected from put-on units. Wood types such as beech whose moisture is evenly distributed between surface and core and which have no branches or spiral growth and have a constant volume weight (specific gravity, gross density), can be measured very well and quickly. Pieces of wood showing heavily varying gross density, different wood thickness, or irregularly distributed humidity can be measured with sufficient accuracy only when using additional tools. When you consider purchasing a put-on unit we recommend consulting our experts.

GRAPHIC C

Typical characteristic curve using an humidity sensor