Operating instructions

GANN BlueLINE

HYDROMETTE *BL*

COMPACT TF-IR

EN

GANN MESS- U. REGELTECHNIK GMBH
70839 GERLINGEN SCHILLERSTRASSE 63 INTERNET: http://www.gann.de
Verkauf National: TELEFON 07156-4907-0 TELEFAX 07156-4907-40 EMAIL verkauf@gann.de
Verkauf International TELEFON +49 7156-4907-0 TELEFAX +49 7156-4907-48 EMAIL sales@gann.de

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0.1 Publication statement

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GANN Mess- u. Regeltechnik GmbH, Gerlingen, Germany, 13 October 2009

0.2 General notes

This measuring device fulfils the requirements of the applicable European and national directives (2004/108/EC) and standards (EN61010). Appropriate declarations and documentation are held by the manufacturer. To ensure trouble-free operation of the measuring device and operational reliability, the user must carefully read the operating instructions. The measuring device may only be operated under the climatic conditions specified. These conditions can be found in Chapter 3.1 "Technical data". This measuring device may likewise only be used under the conditions and for the purposes it was designed for. Operational reliability and functionality are no longer ensured if the device is modified or adapted. Gann Mess- u. Regeltechnik GmbH is not liable for any damage arising from such modifications or adaptations. The risk is borne by the user alone.

- **Laser equipment warning:**

This unit is equipped with a Class 2 laser. Never direct this laser beam into the eyes, neither directly nor indirectly through reflecting surfaces.
Laser radiation may cause irreversible damage to the eyes. When measurements are performed with humans being nearby, the laser beam must be disabled.

- The notes and tables in these instructions on permitted or normal humidity conditions in practice and the general definitions of terms have been taken from the specialist literature. No responsibility can therefore be taken by the manufacturer for the correctness of this information. The conclusions to be drawn from the measurement results are related to the individual conditions and the knowledge drawn from professional experience for each user.

- The measuring device may be operated in residential and commercial areas, as the stricter class B for emitted interference (EMC) has been adhered to.
- The device may not be operated in the immediate area of medical equipment (heart pacemakers, etc.).
- The measuring device may only be properly used as described in these instructions.
- Keep the device and accessories out of the reach of children!

Gann Mess- u. Regeltechnik GmbH accepts no liability for damage resulting from non-adherence to the operating instructions or by not taking proper care during transport, storage or operation of the device, even if this requirement for care is not specifically addressed in the operating instructions.

0.3 WEEE directive 2002/96/EC law on electrical and electronic equipment

Disposal of packaging, battery, and device must be undertaken in accordance with the legal requirements at a recycling centre.

The device was manufactured after 1 May, 2010.

1 Introduction

1.1 Description

The Hydromette *BL* Compact TF-IR is a precise thermo-hygrometer that is fitted with an IR surface temperature sensor and may be used for various applications such as surveillance of residential space, air conditioning systems, print shops, warehouses, etc. Additional features included: single-handed operation, built-in measurement probes, and a 3-line LCD for simultaneous display of three measured values, e. g. air humidity, dew point temperature, and surface temperature.

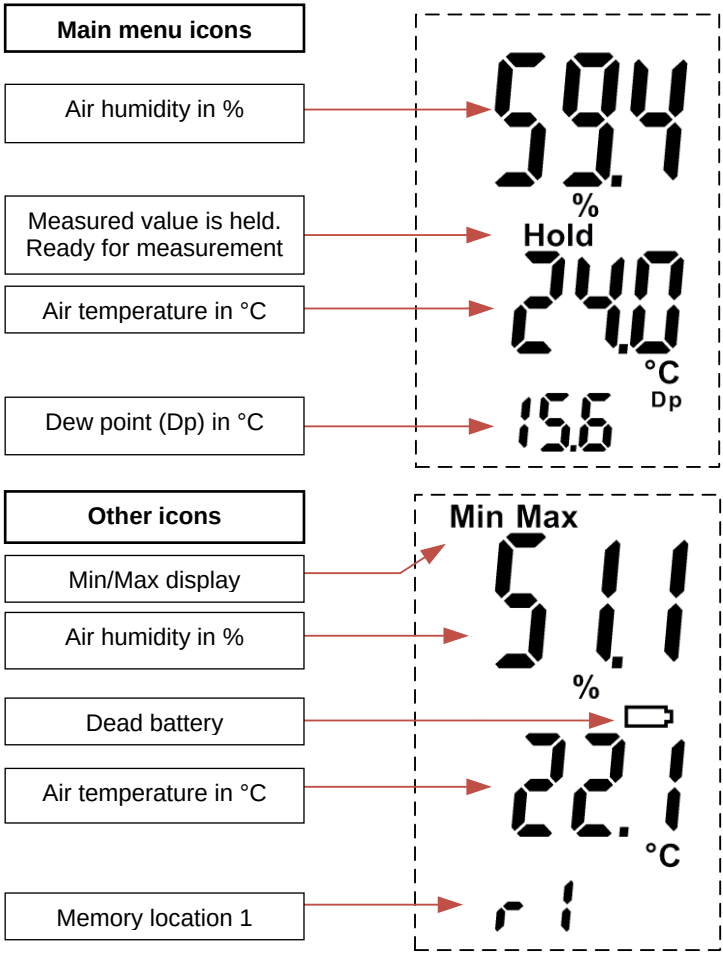
This combination of the different measuring techniques enables the *BL* Compact TF-IR unit to be used for quickly and reliably assessing dew point undershoots or determining borderline conditions on surfaces such as walls, ceilings, floors as well as on window or door lintels.

In addition to displaying the measured value, the unit creates an audible signal when a critical surface temperature is located.

When using the unit in due time, mildew formation may be prevented and occurrence of moistening caused by condensation may be assessed reliably.

1.2 Device layout and button assignment

1.3 Display icons



2 Basic functions

2.1 Switching on the device/Ready mode

The device is switched on by pressing the **On** button .

After the start-up phase, the main menu appears in the "rh" measuring mode (see also section 2.3.2).

Last value measured in %

"Hold" symbol

Last measured temp. in °C

Calculated dew point (Dp) in °C

Figure 2-1: main menu/measuring mode

In this menu, a new measurement can be started by pressing the **"M"** measurement button. See also Chapter 2.2.

.

2.2 Display in measuring mode

Measured value in %

"Hold" symbol signals readiness to make a measurement

Measured temperature in °C

Calculated dew point (Dp) in °C

Figure 2-2: measuring mode

A measurement process is started by pressing the **"M"** button. During the measurement process, the "%" symbol blinks and the values adapt to the surrounding conditions. After releasing the "M" button, the "%" symbol is displayed steadily and the "Hold" symbol also appears.

The device is now in Ready mode.

Press the "M" button again to start a new measurement.

Approx. 40 seconds after releasing the measurement button, the device automatically switches off to save battery power. When the device is switched on again, the last value measured is shown on the display.

2.3 Setting menus

When the **"Up"** or **"Down"** buttons are pressed in *Ready mode*, the various setting menus are shown one after another:

1. **Measurement menu** (*Ready mode*)**:** The measuring process can be carried out here
2. **Measuring mode selection:** Here you can specify the measuring mode (section 2.3.2)
3. **Laser pointer / EM menu:** This menu can be used to disable/enable the laser pointer and to set the emissivity (EM factor).
4. **Maximum value display:** The largest value measured is shown here (section 2.3.3)
5. **Minimum value display:** The smallest value measured is shown here (section 2.3.4)
6. **Saved menu:** The last 5 values measured can be called here (section 2.3.5)

2.3.1 Measurement menu (main menu)

The last measurement with the note **"Hold"** is shown here.

In this menu, a new measurement can be started by pressing the **"M"** button.

During the measuring process, the **"Hold"** symbol disappears from the display. After releasing the **"M"** button, the measured value is saved. The **"Hold"** symbol is displayed again.

If the new measured value is larger than the previous maximum value, **"Max"** flashes on the display. If the value is not to be saved, the **"M"** button must be pressed *briefly*. If the value is not to be saved, a new measurement is started with a *long* press on the **"M"** button without changing the previous maximum values.

2.3.2 Measuring mode selection menu

In this menu, the various modes for the Hydromette *BL* Compact TF-IR unit may be set. The currently active mode is selected with a short press of the M button. The mode then begins to blink. Now a mode can be selected with the Up and Down buttons and confirmed with a short press on the M button.

The BL Compact TF-IR unit has 4 different setting modes that may be scrolled top-down in the following order by pressing the "Down" button:

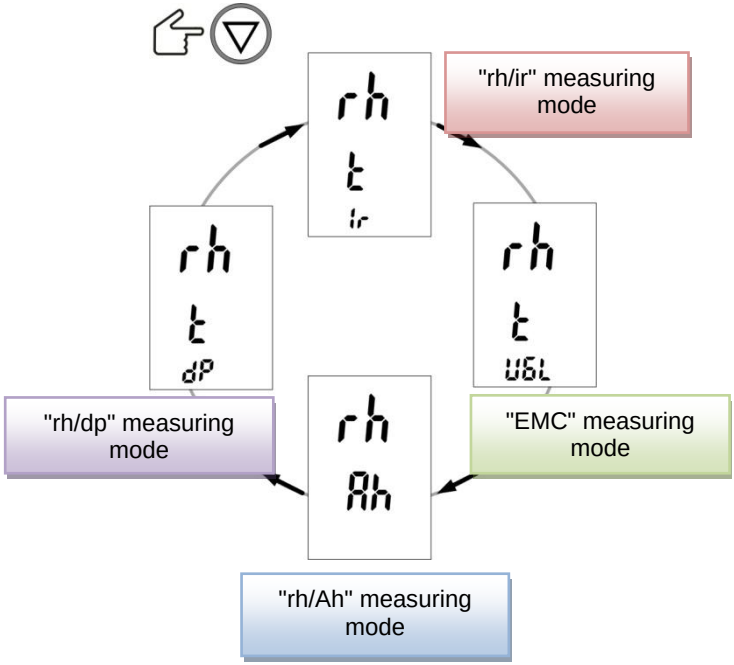


Figure 2-3: measuring mode selection menu

The selected mode changes the display of the measurement menu. Depending on the mode, the appropriate physical dimension is also displayed. The individual menus are scrolled top-down by pressing the "Down" button.

"rh/ir" measuring mode (relative humidity, IR temperature):
Relative humidity (in %), *air temperature (in °C)*, and the *IR surface temperature measured (in °C)* are displayed.

"EMC" measuring mode (equilibrium wood moisture content, EMC):
Equilibrium wood moisture content is the moisture content adopted by the wood when it is exposed to constant climate (constant air humidity and constant temperature) for sufficiently long time.

"rh/Ah" measuring mode (relative/absolute humidity): the *relative humidity (in %)* and the *absolute humidity (in g/m³ i.e. grammes of water in 1m³ of air)* are displayed.

"rh/dp" measuring mode (relative humidity, dew point temperature):
Relative humidity (in %), *air temperature (in °C)*, and *dew point temperature (dp) (in °C)* are displayed.

Information and explanations on the individual measuring modes can be found in Chapter 4 "Application instructions".

2.3.3 Laser pointer / EM settings

"On" or "Off" indicate whether the laser pointer is enabled or disabled.

Emissivity set in %

Figure 2-4: laser pointer

When the default settings for emissivity (EM factor) and laser pointer are to be changed, the **"M"** button must be pressed *momentarily*. Emissivity (EM factor) and laser pointer display now start flashing.

EM factor adjustment:

Using the **"Up"** or **"Down"** buttons, emissivity (EM factor) may now be set between 20% and 100% in 1 unit increments or decrements. The setting is saved by again pressing the **"M"** button *momentarily* (< 1s).

The emissivity table is found in the Appendix.

Laser pointer adjustment:

By holding the **"M"** button depressed for longer than 2 seconds, the status of the laser pointer may be changed from "Off" to "On" and vice versa. To save the status selected and to return to the main menu, the **"M"** button must be pressed *momentarily* (< 1s).

2.3.4 Maximum value display

In this menu, the maximum air humidity value measured in a measurement sequence is displayed. **Only the "rh" relative humidity is displayed.**

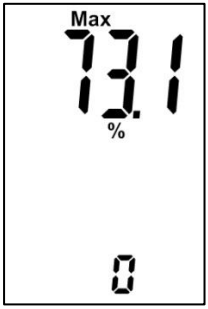


Figure 2-5: maximum value menu

If a maximum value is to be deleted, the displayed value must be selected with a *short* press on the **"M"** button.

The value flashes and can now be deleted using a *long* press on the **"M"** button.

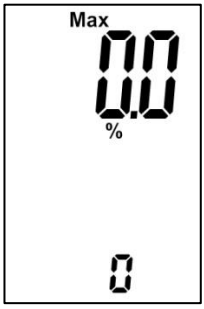


Figure 2-6: deleted max. value

Afterwards, only the "Max" symbol and the % symbol are still blinking. Using another *momentary* press on "M" button, the entry is confirmed and the device returns to the Ready mode.

Using the **"M"** button, a new measurement can then be carried out immediately.

2.3.5 Minimum value display

In this menu, the minimum air humidity value measured in a measurement sequence is displayed. **Only the "rh" relative humidity is displayed.**

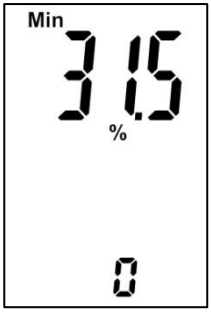


Figure 2-7: minimum value menu

If a minimum value is to be deleted, the displayed value must be selected with a *short* press on the **"M"** button.

The value flashes and can now be deleted using a *long* press on the **"M"** button.

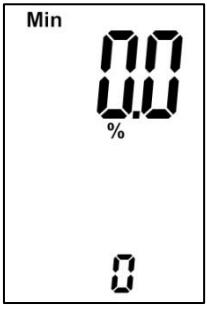


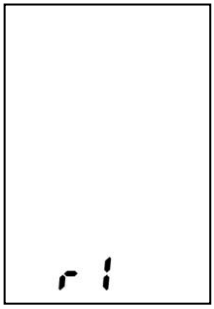
Figure 2-8: deleted min. value

Afterwards, only the "Min" symbol and the % symbol are still blinking. Using another *momentary* press on "M" button, the entry is confirmed and the device returns to the Ready mode.

Using the **"M"** button, a new measurement can then be carried out immediately.

2.3.6 Saved menu

In this menu, the last 5 measured values are saved. The view and the respective units depend on the measuring mode selected.



The memory location number "r1" is displayed for approx. 1 second and then the last measured saved value is displayed that is saved at this location.

You can recognize saved values as there is no "Hold" symbol in the display.

Figure 2-9:
memory location r1

As soon as you select the saved menu, the memory location number "r1" is displayed for approx. 1 second, and then the last measured saved value contained there is displayed.

The last 5 measured values are automatically saved and stored in memory locations "r1" to "r5". The last measured value is in memory location "r1". This is a ring buffer. As soon as the sixth measured value is recorded, the "first" (first measured) measured value is automatically removed from the buffer.

By *momentarily* pressing the **"M"** button, the next memory location "r2" is selected and the value contained there is displayed. After reaching the 5th memory location, the first one is shown again.

The menu can be exited using the **"Up"** or **"Down"** buttons.

2.4 Other functions

2.4.1 Automatic switch-off

If no button is pressed within approx. 40 seconds, the device switches off automatically. The current values are retained and are displayed again after the unit is switched back on.

2.4.2 Battery monitoring

If the battery symbol  appears in the display, the battery is dead and must be renewed.

A list of battery types that can be used can be found in the "Technical data" chapter.

3 Specifications

3.1 Technical data

Display:	3-line display
Display resolution:	0,1 %
Response time:	< 2 s
Storage conditions:	+ 5 to + 40 °C
	- 10 to + 60 °C (short-term)
Operating conditions:	0 to + 50 °C
	- 10 to + 60 °C (short-term)
Power supply:	9V block battery
Approved types:	6LR61 or 6F22
Dimensions:	(L x W x H) 180 x 50 x 30mm
Weight:	approx. 320 g

3.2 Prohibited environmental conditions

- Condensation, air humidity continuously too high (> 85 %) and wetness
- Permanent presence of dust and combustible gases, fumes or solutions
- Ambient temperatures continuously too high (> +50 °C)
- Ambient temperatures continuously too low (< 0 °C)

3.3 Measuring ranges and sensor accuracy

Measuring ranges:

Air:

Humidity: *0 to 100% RH*	20 to 80% r.H. (±2% RH)
Temperature: *-20 to +80 °C*	-10 to +60 °C (±0.3 °C)

IR:

Temperature: *-40 to +380 °C*	0 to +60 °C (±0.5 °C)

4 Application notes

On the following pages, you will find information on the various measuring modes of the BL Compact TF-IR (Sections 4.1, 4.2 and 4.3) and on how to use the unit.

4.1 Measuring air humidity

4.1.1 Absolute humidity

The amount of water vapour in g/m³ in the air is termed absolute humidity. The amount of water vapour cannot exceed a fixed specified amount.

$$\text{Humidity } (abs.) = \frac{Mass\ of\ water\ (g)}{Air\ volume\ (m^3)}$$

4.1.2 Moisture saturation

Moisture saturation is the maximum amount of water that can be contained in a certain volume of air. The higher temperature the larger the amount of water that can be held in the air.

$$Humidity\ (sat.) = \frac{Max.mass\ of\ water\ (g)}{Air\ volume\ (m^3)}$$

4.1.3 Relative air humidity

The relative air humidity is the ratio of the actual water vapour content (absolute humidity) to the moisture saturation. The relative humidity is heavily dependent on the temperature.

$$Humidity\ (rel.) = \frac{Humidity\ (abs.)x\ 100\ (\%)}{Humidity\ (sat.)}$$

4.1.4 Equilibrium wood moisture content (EMC)

The unit is able to simultaneously display relative humidity, temperature, and equilibrium wood moisture content. Thus, parquet reclining or interior finish companies can easily assess whether wooden parts are allowed to be exposed to the existing surrounding climate or damage to the wood such as cracking, shrinking, or swelling up is to be assumed.

Equilibrium wood moisture content is the moisture content adopted by the wood when it is exposed to constant climate (constant air humidity and constant temperature) for sufficiently long time.

4.2 Measuring air temperature

Handling

For particularly precise measurements, particularly for temperatures under +10 °C or above +40 °C, or for significant differences between the temperature of the sensor or measuring device and the surrounding atmosphere, the device should be exposed to the surrounding atmosphere of the measurement location for approx. 10-15 minutes or until the temperature has equalised. The measuring range of -40 °C to +80 °C only applies to the sensor tip (length of the protective/filter cap). The measuring device may only be exposed to temperatures above 50 °C for short periods. False measurements can arise from shielding with body parts (e.g. hand) as well as blowing or speaking/breathing in the direction of the sensor.

The setting time of the air temperature sensor in moving air is approx. 3 minutes for 90 % of the temperature difference.

The air temperature sensor adapts to the surrounding temperature even when stored (not switched on).

4.2.1 Dew point temperature

The dew point is the temperature at which the air is saturated with water vapour. Condensation occurs below this temperature. The dew point generally lies below the air temperature, except with 100 % r.h, where both temperatures are the same.

The dew point is dependent on the air temperature and water vapour partial pressure and equal to the temperature whose saturation pressure is equal to the water vapour partial pressure present. The water vapour partial pressure is calculated as follows:

$$Water\ vapour\ pressure = \frac{rel.humidity\ x\ water\ vapour\ sat.press.}{100}$$

Further information can be found on the Internet.

4.2.2 Dew point temperature vs. air temperature and rel. humidity for condensation calculation

Air temperature	Dew point temperature in °C at a relative humidity of:							
°C	30%	40%	50%	60%	70%	80%	90%	Saturation moisture = amount of water in g/m³
	°C	°C	°C	°C	°C	°C	°C	
30	10,5	14,9	18,5	21,2	24,2	26,4	28,5	30,4
28	8,7	13,1	16,7	19,5	22,0	24,2	26,2	27,2
26	7,1	11,3	14,9	17,6	19,8	22,3	24,2	24,4
24	5,4	9,5	13,0	15,8	18,2	20,3	22,2	21,8
22	3,6	7,7	11,1	13,9	16,3	18,4	20,3	19,4
20	1,9	6,0	9,9	12,0	14,3	16,5	18,3	17,3
18	0,2	4,2	7,4	10,1	12,4	14,5	16,3	15,4
16	-1,5	2,4	5,6	8,2	10,5	12,5	14,3	13,6
14	-3,3	-0,6	3,8	6,4	8,6	10,6	14,4	12,1
12	-5,0	-1,2	1,9	4,3	6,6	8,5	10,3	10,7
10	-6,7	-2,9	0,1	2,6	4,8	6,7	8,4	9,4
8	-8,5	-4,8	-1,6	0,7	2,9	4,8	6,4	8,3
6	-10,3	-6,6	-3,2	-1,0	0,9	2,8	4,4	7,3
4	-12,0	-8,5	-4,8	-2,7	-0,9	0,8	2,4	6,4
2	-13,7	-10,2	-6,5	-4,3	-2,5	-0,8	0,6	5,6
0	-15,4	-12,0	-8,1	-5,6	-3,8	-2,3	-0,9	4,8

4.3 General information on infrared temperature measuring technology (IR)

Any body having a temperature above "absolute zero" (= 0°K or -273°C) emits infrared radiation that is also referred to as thermal radiation. Taking into account the emission ratio, the intensity of this thermal radiation is considered to be a measure for the surface temperature. The infrared sensing head receives the emitted thermal radiation in a non-contact manner and converts it into a voltage signal.

Benefits over contact measurement using mechanical sensor:

- Very fast response or measuring time.
- No heat removal at the object being measured.
- No damage or contamination of the measuring surface.
- Live or moving parts may be measured.

4.4 Measuring using an IR sensor

When measurements are carried out in the immediate vicinity of hot or cold parts (exhaust pipe, radiant heater, or freezing/chiller unit) for more than 10 seconds in duration, the measured value may be distorted. After approximately 10 minutes waiting time (temperature equalisation of sensor housing and ambient temperature), the measurement may be repeated. To obtain exact measured values, the temperature of the measuring unit must have approximated the respective ambient temperature.

To avoid measurement errors and to prevent the unit from being damaged, you should…

- ... not press the sensor opening of the measuring transducer directly onto the object to be measured.

- ... not measure in air that contains steam or is heavily contaminated.
- ... not measure through very hot air (shimmering heat).
- ...not measure objects that are exposed to direct sunlight (shadow these objects).
- ...not measure objects located in immediate vicinity of equipment radiating large amounts of heat (stop thermal radiation).
- ...not expose this high-quality measuring unit to very high or low temperatures (e.g. transporting the unit in the boot).
- ... not expose the unit to high air humidity (condensing).
- ... not measure in immediate vicinity of sources of electromagnetic or electrostatic energy (RF generators, electric motors, ignition voltages etc.).

4.5 Emission ratio

The Hydromette *BL* Compact TF-IR unit provides manual adjustment of the emission ratio between 20% and 100%. The emissivity table is found in the Appendix.

By default, the measuring unit is set to an emission ratio of 95%. This value is valid for the majority of construction materials, plastic, textile or paper types, and non-metallic surfaces. The following summary is for estimating the emissivity that depends, among others, on brilliance and roughness of the material to be measured. Emissivity is reduced on plane and glossy surfaces while it is increased on rough and matt surfaces. Since an emissivity ranging from 10% to 90% for metals is sufficient depending on the surface (glossy, oxidised, or corroded), exact measurements cannot be carried out. For metals or glossy metallic surfaces and objects with other emissivity values, we therefore recommend using special labels (IR 30/E95 **item no. 5833**) that are made of paper and provide a factor of 95%.

Mathematical correction of the temperature measured value using emissivity requires the ambient temperature and the coefficient of the temperature equalisation between measuring transducer and ambient temperature to be known.

The following applies to the correction:

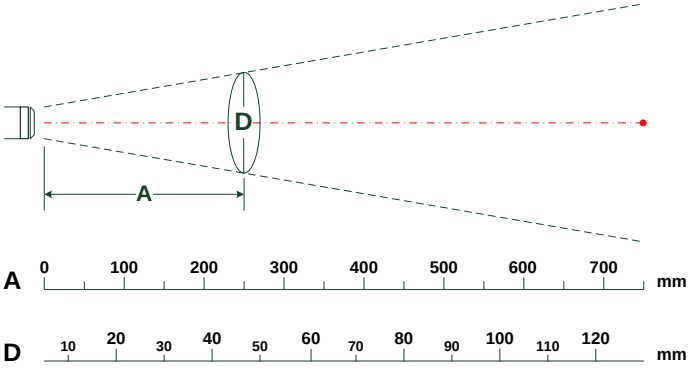
$$\frac{\left(T_{Display} - T_{Ambience}\right) * 100}{Emission\ ratio\ (\%)} + T_{ambience} = T_{Meas.\ obj.}$$

4.6 Measurement spot size

The measurement spot diameter depends on the distance and is 5 mm immediately ahead of the measuring transducer opening. A larger distance (A) between the measuring device and the object to be measured proportionally increases the measuring spot diameter (D) in a ratio of approximately 6:1. With a distance (A) of 250 mm, the measurement spot diameter (D) is 46 mm. For the measuring distance (A) between the surface to be measured and sensor, we recommend using 20 to 50 mm. The respective diameter can be obtained from the figure below.

A = Distance to the object to be measured

D = Measurement spot diameter



5 Appendix

5.1 Emissivity table

Material	Condition	Temperature*	EM factor
Aluminium**	Non-oxidised	25	2
		100	3
	Heavily oxidised	100	20
	Highly polished	100	9
	Slightly polished	100	18
Asbestos			95
Asphalt			95
Lead**	Oxidised		28
	Uncoated	230	6
Stainless steel**	Matt		60
	Oxidised		16
Ice	Surface		100
Iron**	Enamelled		88
	Oxidised		80
	Corroded		64
	Nickel-plated, matt		12
	Nickel-plated, polished		6
	Zinc-plated		27
Soil	Dry		92
	Humid		95
Paint	Black, matt		96
	Black, glossy		92
	Other colours		95
	Clear coat		87
Gypsum	Bulk material		81
	Processed		91
Glass	Plane		94
	Convex	100	80
	Concave	100	82
Gold**			2
Graphite			98

Material	Condition	Temperature*	EM factor
Rubber	Dark		95
	Bright		86
	Hard		88-95
	Soft		67-84
Casting**	Cast iron		94
	Cast iron, polished		21
Skin		38	98
Wood			80-90
Lime			30-40
Lime mortar			93
Copper**	Highly polished		7
	Heavily oxidised		78
Marble			93
Brickwork			95
Brass**	Polished		5
	Oxidised		60
Nickel**	Polished		5
	Oxidised		32
Porcelain			93
Plaster	Lime plaster		92
Sand			90
Snow		-10	85
	Smooth		95
Bolts**			85
Silver**			3
Steel**	Oxidised		80
	Rolled		24
Tar			83
Water			96
Brick	Clay brick		93
Tin**			5

*(No value given in the "Temperature" field indicates, that the values shown are valid for a nominal temperature of 20 °C.)

(Because of their surface, metals cannot be measured precisely (e.g.: oxidised/polished surface ➔ EM factor between 2 and 100%). We therefore recommend using the paper label (IR 30/E95 **item no. 5833) showing a factor of 95%. This label provides for exact object temperature measurements.

5.2 USB connection to GANN DIALOG software

Using a USB cable, the Hydromette *BL* Compact TF-IR unit may be connected to a PC on which Windows operating system is running and which is used to directly retrieve and save the measured values by means of the GANN DIALOG software package. Additionally, the PC may be used for graphically displaying the measured data or further processing them in an Excel spreadsheet.

Note: The Hydromette *BL* Compact TF-IR only saves the most recent 5 measured values. To save more than 5 measured values, a PC on which Windows operating system is running (e.g.: netbook/notebook) must be connected to be used for data storage.

GANN DIALOG (item no. 16083) :

PC application for **control and transfer the measured values** to an IBM compatible PC used for **evaluating** and **printing**, complete, including CD, manual, and MK 26 USB cable, for Windows XP, Vista, and Windows 7.

5.3 General concluding remarks

The notes and tables in these operating instructions on permitted or normal humidity conditions in practice and the general definitions of terms have been taken from the specialist literature. No responsibility can therefore be taken by the manufacturer of the measuring device for the correctness of this information.

The conclusions to be drawn from the measurement results are related to the individual conditions and the knowledge from professional experience for each user. In cases of doubt, for example concerning the permitted moisture content in coating or screed substrates when laying floor coverings, it is recommended to contact the manufacturer of the coating or floor covering and to take account of the recommendations of trade organisations.

Guarantee conditions

Gann Mess- u. Regeltechnik GmbH shall rectify material or manufacturing defects at no cost by repair or replacement of the defective parts at its choice that occur within six months of purchase or one year of dispatch from the factory, whichever period ends first. Neither the replacement nor the repair of a part constitutes a new guarantee or an extension of the original guarantee.

Batteries and other parts subject to wear such as cables or filter material are excluded from the guarantee.

When claiming under the guarantee, the device must be sent postage-free to Gann Mess- u. Regeltechnik GmbH or the supplier with details of the claim and accompanied by proof of purchase.

The guarantee is void if repairs or other manipulations have been carried out by the owner or third party.

Gann Mess- u. Regeltechnik GmbH accepts no liability for damage or malfunctions caused by improper or incorrect handling or storage of the device. Gann Mess- u. Regeltechnik GmbH will on no account accept liability for damage, lost profit, lost usage or other consequential damage that arise from the use of the product or the inability to use it.

-Subject to technical changes-

KNOWHOW