H40.0.01.6C-09

GREISINGER

EN

Digital Precision Hand-held Measuring Device

For Atmospheric Humidity, Temperature, Dew Point, Dew Point Distance, Enthalpy and Flow Speed

As of version V2.9

Operating Manual

GMH 3330

CE

Made in Germany

WEEE-Reg.-No. DE93889386

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Contents

1 General Note

Read this document carefully and get used to the operation of the device before you use it. Keep this document within easy reach near the device for consulting in case of doubt.

The manufacturer is not liable for misprints.

2 Safety

2.1 Intended Use

The safety requirements (see below) have to be observed.
The device must be used only according to its intended purpose and under suitable conditions.
Treat device and sensor carefully. Use only in accordance with above specification. (do not throw, hit against etc.). Protect plug and socket from soiling.

The device combined with the combined measuring probe TFS 0100 is designed for room climate measurements. This includes gauging of atmospheric humidity, temperature, dew point, dew point distance and enthalpy.

Together with the flow rate measuring probes STS 005 and STS 020 the device provides flow rate measurements either in water or in air.

2.2 Safety signs and symbols

Warnings are labelled in this document with the followings signs:

Caution! This symbol warns of imminent danger, death, serious injuries and significant damage to property at non-observance.

Attention! This symbol warns of possible dangers or dangerous situations which can provoke damage to the device or environment at non-observance.

Note! This symbol point out processes which can indirectly influence operation or provoke unforeseen reactions at non-observance.

2.3 Safety guidelines

This device has been designed and tested in accordance with the safety regulations for electronic devices.
However, its trouble-free operation and reliability cannot be guaranteed unless the standard safety measures and special safety advises given in this manual will be adhered to when using the device.

1. Trouble-free operation and reliability of the device can only be guaranteed if the device is not subjected to any other climatic conditions than those stated under "Specification".
   If the device is transported from a cold to a warm environment condensation may cause in a failure of the function. In such a case make sure the device temperature has adjusted to the ambient temperature before trying a new start-up.

2. 
   DANGER
   If there is a risk whatsoever involved in running it, the device has to be switched off immediately and to be marked accordingly to avoid re-starting.
   Operator safety may be a risk if:
   - there is visible damage to the device
   - the device is not working as specified
   - the device has been stored under unsuitable conditions for a longer time.
   In case of doubt, please return device to manufacturer for repair or maintenance.

3. When connecting the device to other devices the connection has to be designed most thoroughly as internal connections in third-party devices (e.g. connection GND with protective earth) may lead to undesired voltage potentials that can lead to malfunctions or destroying of the device and the connected devices.

   
   DANGER
   This device must not be run with a defective or damaged power supply unit.
   Danger to life due to electrical shock!

4. 
   DANGER
   Do not use these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury or material damage.
   Failure to comply with these instructions could result in death or serious injury and material damage.

3 Product Specification

3.1 Scope of supply

The scope of supply includes:

- Device GMH 3330, incl. 9V battery block
- Operation manual

3.2 Operation and maintenance advice

- Battery operation:
  If ‘bAt’ is shown in the lower display the battery has been used up and needs to be replaced. However, the device will operate correctly for a certain time. If ‘bAt’ is shown in the upper display the voltage is too low to operate the device; the battery has been completely used up.

  The battery has to be taken out, when storing device above 50 °C.
  We recommend taking out battery if device is not used for a longer period of time.
  After recommissioning the real-time clock has to be set again.

- Mains operation with power supply

  When using a power supply please note that operating voltage has to be 10.5 to 12 V DC. Do not apply overvoltage!! Cheap 12V-power supplies often have excessive no-load voltage. We, therefore, recommend using regulated voltage power supplies.

  Trouble-free operation is guaranteed by our power supply GNG10/3000.
  Prior to connecting the power supply to the mains makes sure that the operating voltage stated at the power supply is identical to the mains voltage.

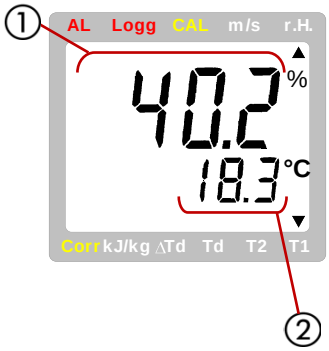
- Treat device and sensor carefully. Use only in accordance with above specification. (do not throw, hit against etc.). Protect plug and socket from soiling.
- To disconnect thermocouple sensor plug do not pull at the cable but at the plug.
- When connecting the TFS or STS - probe the connector may not lock correctly. In such case take the plug not at the casing but at the buckling protection at the end of the plug. If plug is entered correctly, it will slide in smoothly.
- Switch off instrument to change sensors.
- Only use the specified sensors (p.r.t. chapter 4.3 " Connections"). Connecting the instrument to others may damage the instrument and the probe.

4 Handling

4.1 Display

Depending on the measuring probes/sensors connected the following measuring results can be displayed:

TFS 0100:



① **Main display:**
- **r.H.:** relative atmospheric humidity in %

② **Secondary display**: possible views:
- **T1:** temperature of the TFS 0100
- **Td:** dew point temperature of air
- **kJ/kg:** enthalpy

with surface temperature probe at T2:
- **T2:** surface temperature
- **ΔTd:** dew point ratio = T2 - Td

The desired secondary display view can be selected by pressing the Set Menu -key.

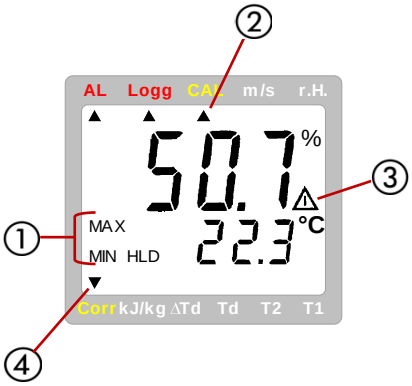
STS 005 or STS 020:

① **Main display:**
- **m/s:** flow rate

② **Secondary display:**
- **t.AVG:** time left till average flow value in seconds will be displayed

with temperature probe at T2 and as soon as the averaging time has been reached:
- **T2:** temperature

Special display elements:



① **Min/Max/Hold**:
shows if a min., max. or hold value is displayed in either the main or the secondary display

② **CAL arrow:**
indicates that a humidity calibration is carried out at the moment

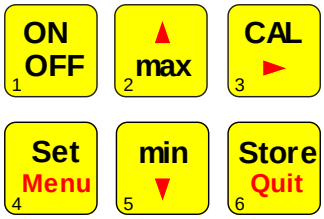
③ **Warning triangle:**
indicates a low battery, full logger storage, etc.

④ **Corr arrow**:
indicates that correction factor is activated

Messages at device startup:

The device will show message at the startup depended on the connected sensor.

4.2 Pushbuttons



On/off key

min/max when taking measurements:

press shortly: min. or max. measuring value will be displayed

\+

press for 1 sec.: the min. or max. value will be deleted

up/down for configuration

to enter values, or change settings

CAL: (for TFS 0100-measuring probe only)

press for 2 sec.: humidity calibration will be started

press >10 sec.: reset of humidity calibration to factory calibration

Set/Menu:

press (Set) shortly: display changes between: T1,T2,Td,ΔTd,kJ/kg (if existing)

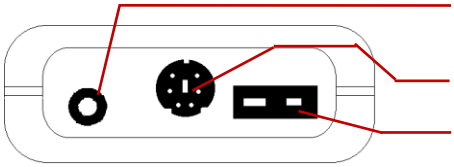
press (Menu) for 2 sec.: configuration menu is activated

Store/Quit:

Measurement: Hold current measuring value ('HLD' in display)
for flow meas. in 'AVGHold' mode: start new measurement or handling of logger functions

Set/Menu: Acknowledge setting, return to measuring

4.3 Connections



Interface: connection for electrically isolated interface adapter (accessory: GRS 3100, GRS3105 or USB3100)

Connection for measuring probes *)

Temperature input T2: Connection for NiCr-Ni-temperature probe (type K) for surface temperature measurements etc.

The mains socket is located at the left side of the instrument.

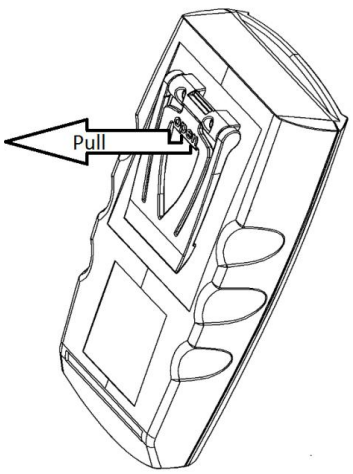
*) the following sensor types can be connected to the connection socket:

- **TFS 0100** (atmospheric humidity and temperature T1)
- **STS 020** (flow speed air, 0.55..20.00m/s)
- **STS 005** (flow speed water, 0.05..5.00m/s)

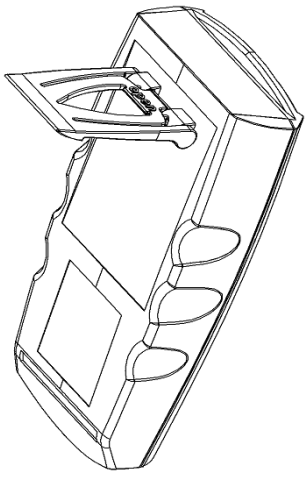
4.4 Pop-up clip

Handling:

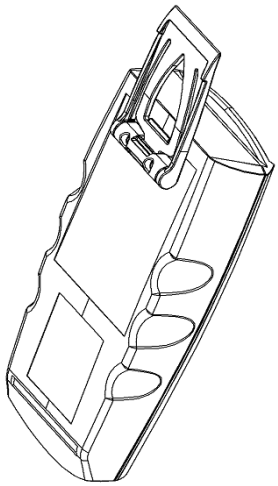
- Pull at label “open” in order to swing open the pop-up clip.
- Pull at label “open” again to swing open the pop-up clip further.



Pop-up clip closed



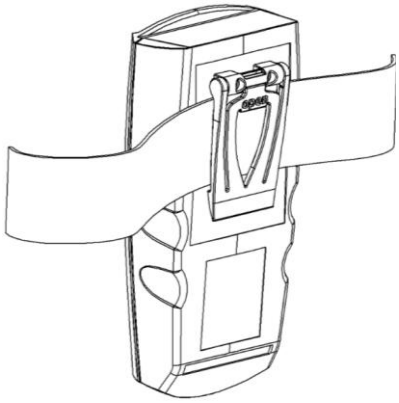
Pop-up clip at position 90°



Pop-up clip at position 180°

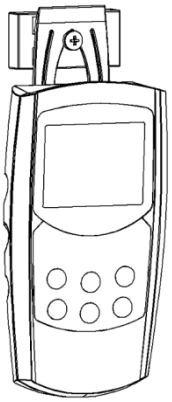
Function:

- The device with a closed pop-up clip can be plainly laid onto a table or attached to a belt, etc.
- The device with pop-up clip at position 90° can be set up on a table, etc.
- The device with pop-up clip at position 180° can be suspended from a screw or the magnetic holder GMH 1300.



Device attached to a belt

Device set up on a table



Device suspended from magnetic holder GMH 1300

5 Configuration

For configuration of the device press Set Menu -key for 2 seconds: the main menu of the configuration will be called up.

Use the keys ▲ max and min ▼ to set the individual value for the parameter. Press the key Set Menu again to memorize the changes and to change to the main menu. Use key Store Quit to leave the configuration.

'AVG': Selection of Averaging Proceedings for Flow Measurement (only STS005/020)

max

Cont: **continuous averaging** - the average value calculated from the measurements conducted during the averaging period will be displayed.

min

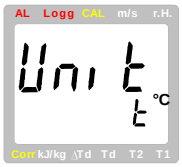
Hold: **press key for averaging** - flow measurements will be taken during the averaging period, then the average value will be calculated and displayed till the next flow measurement is started.

't.AVG': Setting of Averaging Period (only STS005/020)

max

min

1..30: Time for averaging (in seconds) during flow measuring



'Unit': Selection of Temperature Unit

max

°C: All temperature values in degrees Celsius

min

°F: All temperature values in degrees Fahrenheit

'Offset T1': Zero Displacement of Sensor Temperature T1 (only TFS0100)

max

-10.0°C...10.0°C or **-18.0°F...18.0°F:** The zero point of the measurement of T1 will be displaced by this value.

min

off: Zero point displacement is deactivated (=0.0°)

'Offset T2': Zero Displacement of Temperature T2

max

-10.0°C...10.0°C bzw. **-18.0°F...18.0°F:** The zero point of the measurement of T2 will be displaced by this value.

min

off: Zero point displacement is deactivated (=0.0°)

'Corr': Selection of Display Correction Factor

max

1.001...1.200: The temperature value (referring to 0°C or. 32°F) will be multiplied by this factor.

min

off: Factor is deactivated (=1.000)

'Power.off': Selection of Power-Off Delay

max

1...120: Power-off delay in minutes. Device will be automatically switched off as soon as this time has elapsed if no key is pressed/no interface communication takes place. (automatically deactivated for cyclic loggers)

min

off: automatic power-off function deactivated (continuous operation, e.g. in case of mains operation)

'Address': Selection of Base Address

max

01, 11, 21, ..., 91: Base address for interface communication. Channel 1 will be addressed by the set base address, channel 2 to 6 will have the following addresses.
(Example: base address 21 - channel 1 = 21, channel 2 = 22, ..., channel 6 = 26)

min

Using the interface converter GRS3105 it is possible to connect several devices to a single interface. As a precondition the base addresses of all devices must not be identical. In case several devices are connected via one interface make sure to configurate the base addresses accordingly.

6 Measurements Using Combination Measuring Sensor TFS0100

The TFS0100 has been especially designed to carry out measurements of ambient temperature. All TFS0100-probes are interchangeable without recalibration being required. The scope of supply includes one sensor to measure relative atmospheric humidity and another one to measure the ambient temperature T1.

rel. humidity r.H. [%]

relative humidity measured in the tip of the probe. Resolution 0.1%

Ambient temperature T1

temperature measured in the tip of the probe. Resolution 0.1°C or 0.1°F.

Other values on display will be calculated by the measuring device (acc. to Mollier diagram):

Dew point temperature Td

Cold air cannot absorb as much steam as warm air. This means that the **relative** humidity increases as the temperature decreases. If 100% have been reached, the air is saturated with steam; another decrease in temperature results in part of the steam condensing to water, becoming visible as fog or precipitation (dew).
The dew point temperature indicates at which temperature a 100% saturation would be reached and as of when "dew" can be expected.

Enthalpy h [kJ/kg]

Enthalpy refers to the energy content of air. This value always refers to dry air at 0° C. I.e. the energy content of air with a relative humidity of 0% and 0°C is 0kJ/kg. The warmer the air the higher the relative humidity, the higher the energy content. Therefore, more energy is required to heat up humid air than dry air.

All humidity and temperature values calculated from the measuring values refer to a standard atmospheric pressure of 1013 mbar. For measuring atmospheric air, the deviations do not have to be taken into account.
When taking measurements in pressure vessels or under similar conditions, the values have to be corrected in accordance with a suitable correction table.

Additional Measurements with NiCr-Ni-Surface Probe at T2:

Surface temperature T2

The second temperature channel can amongst other things be used to take measurements of surface temperatures.

Dew point distance ΔTd

This measurement refers to measurements of T1, T2 and relative atmospheric humidity.
The combination sensor is used to measure the ambient air, whose condition is used to calculate the dew point Td. The surface sensor is used to measure surfaces within this ambient air, with ΔTd stating the temperature difference between those measurements and the dew point.
Example: measuring the ambient temperature results in a Td of 5°C. As long as the surface-temperature (T2) of a window exceeds 5°C (ΔTd > 0°C) the surface won´t sweat! When T2 falls below 5°C, (ΔTd < 0°C) it will sweat.
Other examples for application: detection of 'humid corners', monitoring of heat exchangers, weather forecast etc..

7 Measurements Using Flow Measuring Probes STS005 / STS020

Two types of measuring probes are available for flow speed measurements:

Please note: -use **STS 005** to measure **water** flow
-use **STS 020** to measure **air** flow
Incorrect use will result in incorrect measurements!

Please observe max. measuring ranges for flow measurements!
-STS 005: 0.05 ... 5.00 m/s (water)
-STS 020: 0.55 ... 20.00 m/s (air)

Higher speeds may destroy the measuring head or may, at least, permanently influence measuring accuracy.
An arrow on the measuring head indicates the required flow direction.
Flow measuring probes are 'free-jet calibrated', i.e. the diameter of the flow channel has to be 5 times bigger than the diameter of the flow measuring head (= approx. 5 cm, otherwise measuring errors up to 40%).
When evaluating the measuring results please also note that in a channel the flow speed is usually higher in the middle of the channel than at its edges. Therefore, use appropriate tables to calculate air flow by means of flow speed.

Averaging for Flow Measurements:

When taking flow measurements fluctuations tend to be quite high. To be able to display a stable measuring value two averaging functions have been integrated in the instrument.

Continuous Averaging

The average value displayed has been calculated from the past few measurements conducted during the averaging time set. After the instrument has been switched on, the time remaining till expiration of the averaging time will be displayed at the bottom line of the display. The min. and max. values memorized refer to the minimum and/or maximum average value displayed.

Average Hold

As soon as the GMH3330 instrument has been switched on the device starts calculating the average flow value during the averaging time. During measuring the **current measuring value** will be shown in the top line of the display while the bottom line shows the remaining measuring time. As soon as measurements have been completed the **average value** will be displayed and the device will switch to the HOLD mode. The min. and max. values memorized refer to the minimum and/or maximum measuring value established during averaging.
To start a new measuring series press the key "Store" (key 6).

Additional Measurements with any NiCr-Ni-Temperature Probe at T2:

Use temperature channel T2 to take measurements of medium temperature, for example. The value shown ist not an average value.

8 Notes to Special Functions

8.1 Zero Displacement (’Offset’)

A zero displacement can be carried out for each of the two temperature channels T1 (TFS0100 only) and T2:

temperature displayed = temperature measured - offset

Standard setting: 'off' = 0.0°, i.e. no zero displacement will be carried out. The zero displacement is mainly used to compensate for sensor deviations. Unless 'off' is set, this value will be displayed shortly after the device is switched on; during operation it will be identified by means of the Corr-arrow in the display.

8.2 Display Correction Factor (’Corr’)

This factor is applied only to the NiCr-Ni-input T2.

temperature displayed [°C] = temperature measured [°C] * Corr
or temperature displayed [°F] = (temperature measured [°F]-32°F) * Corr + 32°F

Standard setting: ’off’ =1.000
This factor is used to compensate for losses of transfer in case of surface measurements, occurring if the object to be measured is extremely hot but will be cooled by lower ambient temperatures. The same can be true for sensors with a large mass. Unless ’off’ is set, this value will be displayed shortly after the device is switched on; during operation it will be identified by means of the Corr-arrow in the display.

8.3 Base Address (’Adr.’)

Using the interface converter GRS3105 it is possible to connect several instruments to a single interface. As a precondition the base addresses of all devices must not be identical. In case several devices will be connected via one interface make sure to configurate the base addresses accordingly.
Channel 1 will be addressed by the base address set, channels 2 - 6 will have the following addresses.

(Example: base address 21 - channel 1 = 21, channel 2 = 22, …, channel 6 = 26)

9 How to Calibrate Meas. of Rel. Humidity Using TFS 0100

Due to the natural aging process of the polymer humidity sensor we recommend to calibrate the sensor at least once a year to ensure optimum measuring accuracy. For optimum recalibration and linearity check, please return device to manufacturer.
Use integrated calibration function for 2-point on-site calibration:

How to calibrate sensor with the calibration device GFN xx

The following humidity variables are acceptable for the automatic buffer detection:

Name	RH at 20°C	Calibration device
KNO3	93%	---
NaCl	76%	GFN 76
MgCl2	33%	GFN 33
Silica-Gel	0%	---

The calibration device GFN XX have been optimized for application with TFS 0100. To ensure highly accurate calibration, we recommend to use these humidity variables only. For more detailed information please refer to the relevant operating manual.

Please note: Automatic temperature compensation during calibration

The rel. humidity to be found in the calibration equipment is quite often highly dependent on temperature. This dependence is automatically compensated for when calibrating with the integrated calibration equipment and automatic detection. In case you want to enter calibration values manually, make sure to enter the respective temperature with the values.

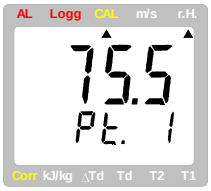
How to carry out calibration

Please note: the calibration is only possible, if the logger memory is empty.

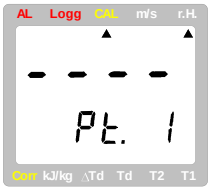
Start calibration: press "CAL" (key 3) for 2 sec. (after more than 10 sec. the factory calibration will be set)
The display prompts you to measure the first humidity value. Use "Set"-key (key 4) to stop calibration whenever you want to. In such a case the last calibration before this one will be used.

1) Selection automatic detection / manual input

Press "CAL"-key (key 3) for a short time to switch over between the various possibilities existing:



automatic detection (acceptable humidity variables see above)
Display will switch over between the acceptable variables.



manual input

If you want to use other humidity values than those provided in the automatic detection, please enter them here.

0 ... 100.0 %: input range for rel. atmospheric humidity.
(please note: Watch out for 'Automatic temperature compensation during calibration')

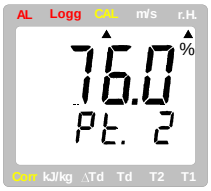
2) Calibration point 1

Put sensor in suitable calibration equipment.

- As long as the individual values in the display for the automatic detection keep changing, a valid value could not be detected yet (humidity value measured may deviate from value set by manufacturer by approx. 10%).
- In case of manual input, enter value here.

As soon as the display stops blinking and changing between values, a stable value has been detected and can be taken over by means of the "Store"-key (key 6). Then the next calibration step will be displayed.

3) Calibration point 2



Put sensor into suitable calibration equipment prepared for the second humidity value. Precondition: If the first value was below 50%, this value has to be over 50% or vice versa. Except this, same procedure as above. As soon as the display stops blinking and changing between values, the measuring value can be taken over by means of the "Store"-key (key 6) and the calibration has been completed.

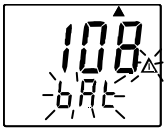
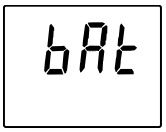
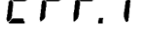
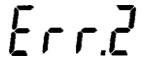
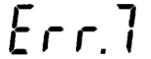
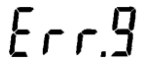
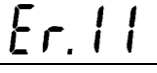
If error messages are displayed when calibrating the instrument, the old calibration keeps valid, the new calibration data are lost. Please refer to "Error and System Messages During TFS0100 Calibration" in chapter 12.

10 System And Error Messages

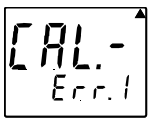
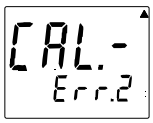
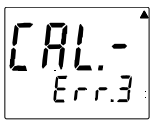
10.1 Messages at device startup

Message (display)	Description
segment test (8888 and all special sign's/arrows)	
identified sensor (tFS 0100, StS 005 or StS020)	
temperature offset of the TFS *(display see chapter 5)*	only with TFS0100 and adjusted offset-value <> off
flow - averaging procedure (AVG Hold or AVG Cont)	only with STS...
flow - averaging period *(display see chapter 5)*	only with STS...
temperature offset for NiCr-Ni-probe *(display see chapter 5)*	only at adjusted offset-value <> off
display correction for NiCr-Ni-probe *(display see chapter 5)*	only at adjusted corr-value <> off

10.2 System and Error Messages

System or error messages	Description / Reason	Remedy
	no probe/sensor connected	connect probe/sensor
	probe/sensor damaged	probe/sensor defective → return to manufacturer for repair
	Low battery voltage, device will only continue operation for a short time	replace battery
	Low battery voltage	replace battery
	If mains operation: wrong voltage	replace power supply, if fault continues to exist: device damaged
No display or mazy characters	Battery voltage too low	replace battery
	If mains op.: power supply defective or wrong voltage/polarity	check/replace power supply
	System error	disconnect battery or power supply, wait for a short time, re-connect
	device defective	return to manufacturer for repair
	Values exceeding measuring range	Check: are there any values exceeding the measuring range specified? ->meas. value too high
	Sensor/cable defective	-> replace
	Values below measuring range	check: are there any values below the measuring range specified? ->meas. value too low
	Sensor/cable defective	-> replace
	System fault	switch on again: if fault continues to exist, device is damaged -> return to manufacturer for repair
	Instrument not within working temperature	keep working temperature in between -25...50°C
	No probe/sensor existing or probe/sensor defective	connect probe/sensor; probe/sensor damaged -> return to manufacturer for repair
	Value cannot be calculated	One measuring variable required for calculation is missing (no sensor) or incorrect (overflow/underflow)

10.3 System and Error Messages during TFS0100 Calibration

Error or system messages	Description / Reason	Description / Reason
	Deviation to high (zero point)	correct humidity variable?
		no -> probe no longer within permissible tolerances, return to manufacturer for recalibration.
	Difference point1-point2 too small	difference has to be at least 40% if values are entered manually select suitable
	Incorrect temperature	calibration is only permissible in the temp. range from 5 ... 40°C

11 The serial interface

By means of the serial interface and a suitable electrically isolated interface adapter (USB 3100, USB 3100 N, GRS 3100 or GRS 3105) the device can be connected to a computer for data transfer.
To avoid transmission errors, there are several security checks implemented e.g. CRC.

The following standard software packages are available:
- **GMHKonfig**: Software for a comfortable editing of the device (freeware)
- **EBS 20M / 60M**: 20-/60-channel software to display the measuring values

In case you want to develop your own software we offer a **GMH3000-development package** including:
- a universally applicable Windows functions library ('GMH3x32e.DLL') with documentation that can be used by the most programming languages. Suitable for Windows XP™, Windows Vista™, Windows 7™, Windows 8 / 8.1™, Windows 10™

  Programming examples Visual Basic 4.0™, Delphi 1.0™,

The following interface functions will be supported:

Channel						Dll-Code	Name / function
1	2	3	4	5	6		
x	x	x	x	x	x	0	Read nominal value
x	x	x	x	x	x	3	Read system status
x						12	Read ID-no.
x	x	x	x	x	x	199	Read meas. type in display
x	x	x	x	x	x	200	Read min. display range
x	x	x	x	x	x	201	Read max. display range
x	x	x	x	x	x	202	Read unit of display
x	x	x	x	x	x	204	Read decimal point of display
x						208	Read channel count
	x	x				216	Read offset correction
		x				218	Read corr. factor (1000..1200)
x						240	Reset unit
x						254	Read program identification

For TFS 0100:
Channel 1: rel atmospheric humidity
Channel 2: temperature T1
Channel 3: temperature T2
Channel 4: dew point temp. Td
Channel 5: dew point distance ΔTd
Channel 6: enthalpy h

For STS 005 / STS 020:
Channel 1: flow speed
Channel 3: temperature T2
Channel 2, 4, 5, 6: not supported

For NiCr-Ni (without TFS../STS..)
Channel 3: temperature T2
Channel 1, 2, 4, 5, 6: not supported. Logger handling still works with channel 1.

12 Specification

Measuring ranges with TFS 0100 E probe

Humidity	0.0 ... 100.0 % relative atmospheric humidity	(resolution 0.1 % RH)
Ambient temperature	-40.0 ... +120.0 °C (0.0...60.0°C with TFS0100)	(resolution 0.1 °C / 0.1 °F)
Surface temperature	-80.0 ... +250.0 °C	(resolution 0.1 °C / 0.1 °F)
Units calculated:		
Dew point temperature	-40.0 ... +70.0 °C	(resolution 0.1 °C / 0.1 °F)
Dew point distance	-200.0 ... +290 °C	(resolution 0.1 °C / 0.1 °F)
Enthalpy	0 ... 250 kJ/kg	(resolution 0.1 kJ/kg)

Measuring ranges with STS 005 or STS 020 probes

Flow speed depending	on probe	(resolution 0.01 m/s)
Temperature	-80.0 ... +250.0 °C	(resolution 0.1 °C / 0.1 °F)

Accuracy device (± 1digit) (at nominal temperature)

Rel. atmospheric humidity	± 0.1%
Ambient temperature T1	± 0.2%
Surface temperature T2	± 0.5% of m.v. ± 0.5°C
Flow speed	± 0.1%

Surface temperature input T2 (NiCr-Ni, type "K")

Comparison point	± 0.5°C
Temperature drift	0.01%/K

Averaging of flow speed

Averaging period	1 .. 30 seconds

Nominal temperature	25°C
Working temperature	-25 to +50°C
Relative humidity	0 to 95%r.F. (non-condensing)
Storage temperature	-25 to +70°C
Housing	142 x 71 x 26 mm (L x W x D), impact-resistant ABS plastic housing, membrane keyboard, transparent panel. Front side IP65, integrated pop-up clip for table top or suspended use.
Weight	approx. 160 g
Interface	serial interface (3.5mm jack), serial interface can be connected to RS232 or USB interface of a PC via electrically isolated interface adapter GRS3100, GR3105 or USB3100 (accessories).
Power supply:	9V-battery, type IEC 6F22 (included) or additional d.c. connector (internal pin Ø 1.9 mm) for external 10.5-12V direct voltage supply.  (suitable power supply: GNG10/3000)
Power consumption	approx. 2.5 mA (incl. TFS0100)
Display	2 four digit LCDs (12.4mm high and/or 7 mm high) for measuring values, and/or for min./ max values, hold function, etc. as well as additional pointing arrows.
Pushbuttons	6 membrane keys altogether for on/off switch, selection of thermoelements, min. and max. value memory, hold-function etc.
Min-/max-value memory	Both the max. and the min. value will be memorized for each measurement taken
Hold-function	Press button to store current measuring values
Automatic-off-function	Device will be automatically switched off if no key is pressed/no interface communication takes place for the time of the power-off delay. The power-off delay can be set to values between 1 and 120 min.; it can be completely deactivated.
EMC:	The device corresponds to the essential protection ratings established in the Regulations of the Council for the Approximation of Legislation for the member countries regarding electromagnetic compatibility (2004/108/EG). Additional fault: <1%

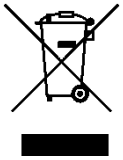
13 Reshipment and Disposal

13.1 Reshipment

All devices returned to the manufacturer have to be free of any residual of measuring media and other hazardous substances. Measuring residuals at housing or sensor may be a risk for persons or environment

Use an adequate transport package for reshipment, especially for fully functional devices. Please make sure that the device is protected in the package by enough packing materials.

13.2 Disposal instructions



Batteries must not be disposed in the regular domestic waste but at the designated collecting points.

The device must not be disposed in the unsorted municipal waste! Send the device directly to us (sufficiently stamped), if it should be disposed. We will dispose the device appropriate and environmentally sound.