

EN

GMH 3351

Digital precision handheld measuring device



Members of GHM GROUP:

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1 About this documentation

1.1 Foreword

Read this document carefully and familiarise yourself with the operation of the product before you use it. Keep this document ready to hand and in the immediate vicinity of the product so that it is available to the personnel/user for reference at all times in case of doubt.

The product was developed according to the state of the art and fulfils the requirements of the applicable European and national Directives. All corresponding documents are available from the manufacturer.

Only technically qualified persons are permitted to carry out commissioning, operation, maintenance and decommissioning. The qualified personnel must have carefully read and understood the operating manual before beginning any work.

1.2 Purpose of the document

- This document describes the operation and maintenance of the product.
- It provides important information for working safely and efficiently with the product.
- In addition to the quick reference guide with all relevant legal and safety content in hard copy, this document is a detailed reference option for the product.

1.3 Legal notices

The liability and warranty of the manufacturer for damages and consequential damages are voided with misuse, disregarding this document, disregarding safety notices, assignment of inadequately qualified technical personnel and arbitrary modifications of the product.

Only carry out the maintenance and service tasks on this product that are described in this documentation. In the process, adhere to the specified steps. For your own safety, only use original spare parts and accessories of the manufacturer. We assume no liability for the use of other products and resulting damage.

This document is entrusted to the recipient for personal use only. Any impermissible transfer, duplication, translation into other languages or excerpts from this operating manual are prohibited.

The manufacturer assumes no liability for print errors.

1.4 Correctness of content

The contents of this document were checked for corrected and are subject to a continuous correction and updating process. This does not rule out potential errors. In the event that errors are discovered or in case of suggestions for improvement, please inform us immediately via the indicated contact information in order to help us make this document even more user-friendly.

1.5 Layout of this document

Description

Each chapter is explained at the beginning in the description.

Prerequisite

All mandatory prerequisites are then listed for each step.

Instruction

Tasks to be carried out by the personnel / user are represented as numbered instructions. Adhere to the sequence of the specified instructions.

Representation

Shows an illustrative instruction or a configuration of the product.

Formula

Some instructions include a formula for a general understanding of a configuration, programming or a setting of the product.

Outcome of an action

Result, consequence or effect of an instruction.

Emphases

In order to simplify legibility and provide a clearer overview, various sections / information are emphasised.

- *Display elements*
- *Mechanical controls*
- **Product functions**
- **Product labels**
- Cross-reference [▶ p. 4]
- *Foot notes*

1.6 Further information

Software version of the product:

- V1.0 or later
- After the product has been switched on with the *On/Off* button, the current software version can be viewed by pressing the *max* button and the *min* button.

2 Safety

2.1 Explanation of safety symbols



DANGER

This symbol warns of imminent danger which can result in death, severe bodily injury, or severe property damage in case of non-observance.



CAUTION

This symbol warns of potential dangers or harmful situations which can cause damage to the device or to the environment in case of non-observance.



NOTE

This symbol indicates processes which can have a direct influence on operation or can trigger an unforeseen reaction in case of non-observance.

2.2 Foreseeable misuse

The fault-free function and operational safety of the product can only be guaranteed if generally applicable safety precautions and the device-specific safety instructions for this document are observed.

If these notices are disregarded, personal injury or death, as well as property damage can occur.



DANGER

Incorrect area of application!

In order to prevent erratic behaviour of the product, personal injury or property damage, the product must be used exclusively as described in the chapter Description [▶ p. 8] in the operating manual.

- Do not use in safety / Emergency Stop devices!
- The product is not suitable for use in explosion-prone areas!
- The product must not be used for diagnostic or other medical purposes on patients!

2.3 Safety instructions

This product has been designed and tested according to the safety requirements for electronic measuring devices. The product must be used according to the technical data. Technical data [▶ p. 34].



CAUTION

Erratic behaviour!

On suspicion that the product can no longer be operated without danger, it must be decommissioned and prevented from recommissioning with appropriate labelling. The safety of the user can be impaired by the device if, for example, if it shows visible damage, it no longer works as specified or if it was stored for an extended period of time under unsuitable conditions.

- Visual inspection!
- In case of doubt, send the product to the manufacturer for repair or maintenance!



CAUTION

Avoid overvoltage!

Check the voltage when connecting to a mains adapter. Simple mains adapters can have an excessively high open circuit voltage, which could cause a malfunction or destroy the product.

- Use a suitable mains adapter with a voltage between 10.5 and 12 V DC!
- The operating voltage on the mains adapter must match the mains voltage!



NOTE

The fault-free function and operational safety of the product can only be guaranteed under the climatic conditions specified in the chapter Technical data. If the product is transported from a cold environment into a warm environment, the device can malfunction due to condensate formation. In this case, wait for the assimilation of the device temperature to the environmental temperature.



NOTE

This product does not belong in children's hands!

2.4 Intended use

The product is designed for room climate measurements in combination with the combination measuring probe TFS 0100E. This comprises detection of air humidity, temperature, dewpoint, dewpoint distance and enthalpy.

Together with the flow measuring probes STS 005 and STS 020, the product enables measurement of the flow speed of water and/or air.

2.5 Qualified personnel

For commissioning, operation and maintenance, the relevant personnel must have adequate knowledge of the measuring process and the significance of the measurements. This document makes a valuable contribution to this. The instructions in this document must be understood, observed and followed.

In order to avoid any risks arising from interpretation of the measurements in the concrete application, the user must have additional expertise. The user is solely liable for damages/danger resulting from misinterpretation due to inadequate expertise.

3 Description

3.1 Scope of delivery

Please check to ensure the completeness of the product after opening the package. You should find the following components:

- Handheld measuring device, ready for operation, including battery
- Operating manual

3.2 Functional description

The product is a universal precision hygrometer/thermometer with flow meter and additional thermocouple input in a single device. The interchangeable probes can be change without recalibration, because they store their calibration data in an integrated buffer and/or are interchangeable due to the high mechanical precision.

The product can be switched on, switched off and configured and the measurements and parameters can be adjusted and held with the operating elements. The product has a universal output, a sensor connection and a temperature input. The T2 thermocouple input is optimised to detect surface temperatures, for example, in order to be able to display the distance from the dewpoint directly.

4 The product at a glance

4.1 The GMH 3351



LCD Display



GMH 3351



Connections

4.2 Display elements

Upper display bar

- AL Alarm
- Logg Logger
- CAL Humidity calibration
- m/s Unit
- r.H. Relative air humidity in %

- An arrow appears under AL when activated
- If a logger function is active, an arrow appears under Logg
- If humidity calibration is in progress, an arrow appears under CAL
- The flow speed is displayed in m/s in the main display
- If a relative air humidity measurement is active, an arrow is displayed below r.H.

Main display



TFS 0100E

Measurement of the current relative air humidity in %

STS 005 / STS 020

Measurement of the current flow speed in m/s

Auxiliary display



TFS 0100E

T1: Temperature of the TFS 0100E

Td: Dewpoint temperature of the air

kJ/kg: Enthalpy

With sensor at temperature input: T2

T2: Surface temperature

ΔTd: Dewpoint distance T2 – Td

STS 005 / STS 020

t.AVG: Remaining time until display of the average flow value in s

With sensor at temperature input: T2

T2: Temperature

Lower display bar

Corr	Correction factor	Was a customer-side sensor calibration carried, an arrow is displayed above Corr
		An arrow indicates which value is displayed in the secondary display
kJ/kg	Enthalpy	Kilojoules per kilogramme
ΔT_d	Dewpoint distance	T2 - Td
Td	Dewpoint temperature of the air	Unit in °C or °F
T2	Surface temperature	Unit in °C or °F
T1	Temperature of the TFS 0100E	Unit in °C or °F

4.3 Operating elements



On / Off button

Press briefly
Long press

Switch on the product
Switch off the product



max / min button



Press briefly

Long press

Min measured value
Max measured value
Value input and changes to settings in configuration
Delete Min/Max measured value



cal button

Press 2s
Press 10s

Start humidity calibration
Reset humidity calibration to factory calibration



set button

Press briefly

Press 2s

Change of the secondary display: kJ/kg ΔT_d , Td, T2, T1
View the configuration



store button

In a measuring

In menus

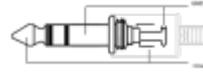
Hold the current measurement
Start a new measurement
Operation of the logger function
Confirmation of the entry
Return to measuring

4.4 Connections

Output OUT

Connection for galvanically isolated interface adapter e.g. GRS 3100, GRS 3105, USB 3100

Analogue output (only GMH 3351)



The 3rd contact has to be left floating! Only stereo plugs are allowed!

Sensor connection

TFS 0100E, air humidity and temperature T1

STS 020, air flow speed. 0.55 .. 20 m/s

STS 005, water flow speed. 0.05 .. 5 m/s

Temperature input T2

Connection for temperature probe type K for measurement of surface temperatures

Dc connector



This is located on the left side of the product

4.5 Support stand

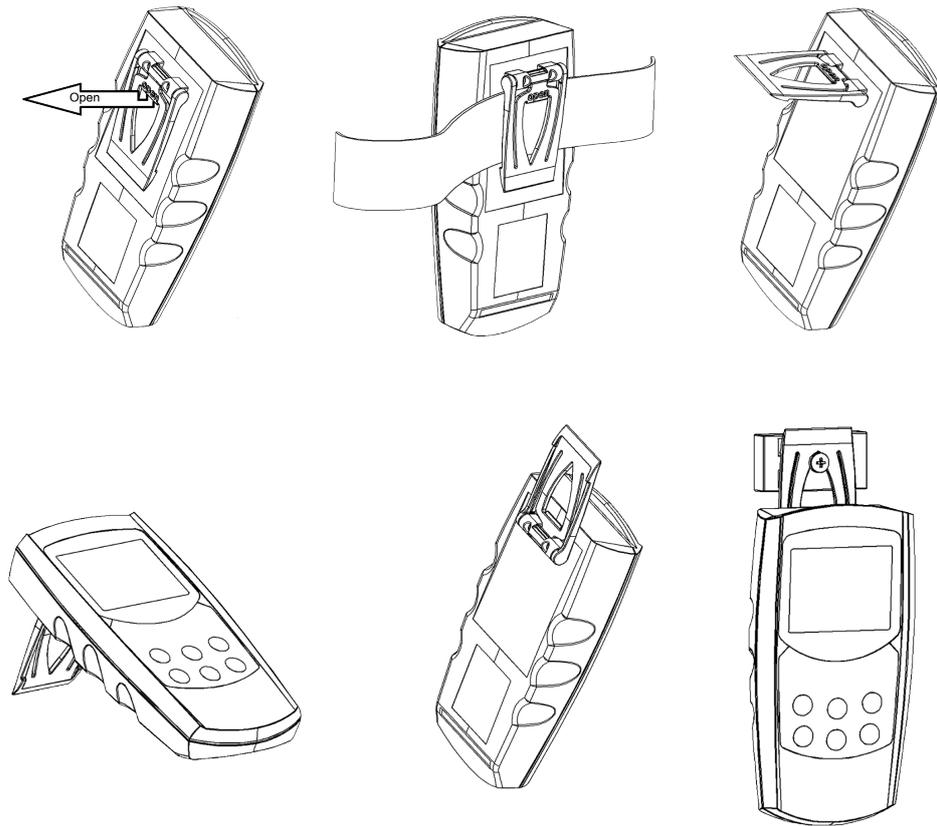
Description

The stand is provided as a means to prop up or support the device in a stable surface, for hanging on the wall or for attachment to a belt.

Instruction

1. Leave the stand collapsed in order to lay the product flat on a stable surface or to hang it on a belt.
2. Pull the grip labelled **open** in order to fold it out to a 90° angle. Now, the product can be positioned on a stable surface.
3. Pull the grip labelled **open** again in order to fold it out to a 180° angle. Now the product can be hung.

Representation



Outcome of an action

The product can be positioned ideally so that the display can always be read clearly and easily depending on its use.

5 Operation

5.1 Commissioning

5.1.1 Explanation

Description	The product is switched on with the <i>On/Off button</i> . It may be necessary to configure the product after switching on. See Configuration [▶ p. 13].
Prerequisite	<ul style="list-style-type: none">– Sufficiently full batteries are inserted in the product.– A suitable measuring sensor is plugged in.
Instruction	<ul style="list-style-type: none">– Press the <i>On/Off button</i>.
Outcome of an action	Information about the configuration of the product appears in the display. <ul style="list-style-type: none">– The product is now ready for measurement.

5.2 Configuration

5.2.1 Explanation

The following steps describe how to adapt the product for your purposes.



NOTE

There are various configuration parameters available depending on the product version and configuration. They can differ depending on the product version and configuration.

5.2.2 Opening the configuration menu

Description	In order to configure the product, you must first open the Configuration menu. The menu is opened as shown in the illustration.
Prerequisite	<ul style="list-style-type: none">– The product is switched on.
Instruction	<ol style="list-style-type: none">1. Press the <i>Function key</i> for 2 seconds to open the Configuration menu.2. SET CONF appears in the display. Release the function key.3. By briefly pressing the <i>set</i> button, you can scroll through the submenu of the Configuration menu. Select the parameter you would like to configure with the <i>cal</i> button.4. When you have selected the desired parameter, change the parameter to the desired value with the <i>max</i> button and the <i>min</i> button.5. The changes are saved by pressing the <i>set</i> button again.6. The Configuration menu is exited with the store button.

Representation

Call up menu



Select sub-menu



Select parameter



Change value



Exit menu and save changes



Press: Single step

Hold: Rapid change

Outcome of an action

You exit the *Configuration* menu with the *store* button and return to the main display.



NOTE

If the product is switched off without saving the configuration, the last save value is reproduced on the next start-up of the product.

5.2.3 Configuring parameters of the configuration menu

Description

– The *Configuration* menu is open. See Opening the configuration menu.

Prerequisite

Instruction

1. Select the desired submenu item with the *set* button.
2. Select the desired parameter you would like to configure with the *cal* button.
3. Adjust the desired configuration in the selected parameter with the *max* button and *min* button.
4. Confirm your selection with the *set* button or with the *cal* button.
5. The available configuration options are listed for each parameter in the following representation.

Representation

Menu	Parameter	Value	Meaning

Logger data

rERd LoGg

Read logger data

Only if *Stor* has been selected under *FUnC* and data has been stored

Data logger [▶ p. 24]

General settings

<i>SEt Conf</i>		General settings
		* Only if there is no logger data in the data buffer
* <i>AVG</i>		Averaging process only with the STS 005 / STS 020
	<i>Cont</i>	Averaging in progress
	<i>hold</i>	Averaging process at the push of a button
* <i>tAVG</i>		Duration of the averaging process in s only with the STS 005 / STS 020
	<i>1..30</i>	
* <i>Unit</i>		Temperature unit
	$^{\circ}\text{C}$	
	$^{\circ}\text{F}$	
<i>P.off</i>		Auto Power-Off
	<i>1..120</i>	Shut-down delay in min
	<i>off</i>	Deactivate

Interface and analogue output

<i>SEt out</i>		Interface and analogue output
<i>out</i>		Universal output
	<i>off</i>	No output function, minimum power consumption
	<i>SEr</i>	Universal output is serial interface
	<i>dRc</i>	Universal output is analogue output
<i>Adr.</i>		Address if <i>out</i> = <i>SEr</i>
	<i>01, 11..91</i>	Base address of the interface
<i>dR.in</i>		Measurement input of the analogue output if <i>out</i> = <i>dRc</i>
		The following parameter selections are signalled by an arrow in the display
	<i>min/s</i>	Flow speed
	<i>r.H.</i>	Relative air humidity
	<i>t1</i>	Temperature of the TFS 0100E
	<i>t2</i>	Surface temperature
	<i>Td</i>	Dewpoint temperature of the air
	ΔTd	Dewpoint distance
	<i>kJ/kg</i>	Enthalpy
<i>dRc.0</i>		Zero point adjustment if <i>out</i> = <i>dRc</i>
	<i>Min .. Max</i>	Measurement dependent on <i>dR.in</i> with analogue output 0V
<i>dRc.1</i>		Inclination adjustment
	<i>Min .. Max</i>	Measurement dependent on <i>dR.in</i> with analogue output 1V if <i>out</i> = <i>dRc</i>

Sensor calibration

SEt Corr Sensor calibration

<i>aFS.1</i>		T1 zero point shift only with TFS 0100E
	-10.0 °C .. 10.0 °C	
	-18.0 °F .. 18.0 °F	
	<i>aFF</i>	Deactivated
<i>aFS.2</i>		T2 zero point shift
	-10.0 °C ... 10.0 °C	
	-18.0 °F .. 18.0 °F	
	<i>aFF</i>	Deactivated
<i>SCF.2</i>		T2 display correction factor
	0.950 .. 1.200	
	<i>aFF</i>	Deactivated
<hr/>		
Alarm		
<i>SEt AL</i>		Alarm function
		* Only if <i>on</i> or <i>no.5a</i> has been selected
<i>AL</i>		Alarm
	<i>aFF</i>	Deactivated
	<i>no.5a</i>	Acoustic signal inactive
	<i>on</i>	Acoustic signal active
* <i>AL.in</i>		Alarm measurement input
	min/s	Flow speed
	<i>r.H.</i>	Relative air humidity
	T1	Temperature of the TFS 0100
	T2	Surface temperature
	Td	Dewpoint temperature of the air
	ΔTd	Dewpoint distance
	kJ/kg	Enthalpy
* <i>AL.Lo</i>		Min. alarm limit
	Min .. Max	Adjustment range dependent on <i>AL.in</i> if <i>AL</i> = not <i>aFF</i>
* <i>AL.Hi</i>		Max. alarm limit
	Min .. Max	Adjustment range dependent on <i>AL.in</i> if <i>AL</i> = not <i>aFF</i>
<hr/>		
Logger function		
<i>SEt LOGG</i>		Logger functions only if logger data is available
<i>Func</i>		Logger function
	<i>aFF</i>	Deactivated
	<i>CYCL</i>	
	<i>Stor</i>	Single value
<i>CYCL</i>		Cycle time only if <i>Func</i> = <i>CYCL</i>
	0:01 .. 60:00	For cyclical logger in min

Time and date

SEt CLoC

Adjustment of real-time clock

CLoC

Time

HH:MM

Hours and minutes

YERr

Year

YYYY

Year

dRtE

Date

DD.MM

Day and month

Outcome of an action

The changed value is stored. The *Configuration* is closed by pressing the **store** button.**NOTE**

The configuration is closed if no button is pressed for 2 minutes. Any changes made up to that point are not saved.

6 Bases for measurement

6.1 Special functions

Zero point shift

A zero point shift can be made for each of the two temperature channels T1 (only TFS0100) and T2.

Formula

Displayed temperature = measured temperature - zero point shift

Standard setting is off. That means 0.0° and that a zero point shift cannot take place. The zero point shift is used primarily to compensate for sensor deviations. If a different value than off is adjusted, it is displayed briefly when the device is switched on and indicated by the Corr arrow in the display during operation.

Display correction factor

This factor only has an effect on the Typ-K input T2.

Formula

[°C]: Displayed temperature = measured temperature * Corr

[°F]: Displayed temperature = (measured temperature - 32 °F) * Corr + 32 °F

Standard setting is off = 1.000

This factor is provided to compensate for thermal transition losses in surface measurements. These occur when very high temperatures of objects should be measured, the surface of which is cooled down by the cooler environment. Similar effects can also occur with sensors with a greater mass. If a different value than off is adjusted, it is displayed briefly when the device is switched on and indicated by the Corr arrow in the display during operation.

Base address

Multiple products can be queried simultaneously via an interface using the GRS3105 interface converter. For this purpose, it is prerequisite that all products have a different base address. If multiple products are connected together via an interface, the base addresses must be configured accordingly.

Channel 1 of the product is addressed via the adjusted base address. Channels 2 to 6 have the following addresses.

Example

Base address 21 + Channel 1 = 21

+ Channel 2 = 22

etc.

Alarm

The product offers 3 different alarm settings.

oFF	Deactivated
oN	Acoustic signal active
no.5o	Acoustic signal inactive

Depending on which sensors are used, you can select which channel should be monitored with the alarm function.

The following conditions trigger an alarm on activation.

- The lower or upper alarm limit for the channel to be monitored is undercut or exceeded.
- FE 9 or FE11 for the channel to be monitored.

- Weak battery.
- FE 7: System error is signalled with an acoustic signal independently of the alarm setting.



NOTE

If one or multiple alarm conditions are applicable, the arrow at AI is displayed. The PRIO flag is set in case of interface access.

Real-time clock

The real-time clock is required for the assignment of the time of the logger data. Therefore, if necessary, check the setting:

- Adjustment via keyboard: Time, date, year.
- Adjustment via interface: With relevant software, e.g. GSOFT3050.
- The time must be checked when changing batteries.

6.2 Measurements with the TFS 0100E combination measuring probe

The TFS 0100 is specially developed for room climate measurement. TFS 0100 probes are not interchangeable without recalibration. It includes a sensor for measurement of relative air humidity and a sensor for measurement of environmental temperature T1.

6.2.1 Relative air humidity r.H.

Air humidity measured in the probe tip with 0.1% resolution.

6.2.2 Environmental temperature T1

Temperature measured in the probe tip. 0.1°C or 0.1°F resolution. Additional display values are calculated according to the Mollier diagram of the product:

6.2.3 Dewpoint temperature Td

Cold air can absorb less water vapour than warm air. Consequently, as the temperature decreases, the relative air humidity increases. If 100% is reached, the air is saturated with water vapour, and additional cooling has the effect that part of the water vapour condenses into water and is visible as mist or precipitation (dew).

The dewpoint temperature indicates the temperature at which 100% saturation is reached and from which dew should be expected.

6.2.4 Enthalpy h

Enthalpy indicates the energy content of the air. This value is based on dry air at 0 °C and 0 % relative air humidity. In other words, air with 0 % relative air humidity and 0 °C has the energy content 0 kJ/kg. The warmer the air is and the higher the relative air humidity is, the greater the energy content will be. As a result, it is apparent that more energy is required to heat up humid air than dry air.



NOTE

All display values calculated from the humidity and temperature measurements are based on normal air pressure of 1013 mbar. The deviations for measurement of atmospheric air are negligible. The values must be corrected based on suitable tables for measurements in pressure vessels and similar equipment.

6.2.5 Surface temperature T2

Surface temperatures, etc. can be measured with the second temperature channel.

6.2.6 Dewpoint distance ΔT_d

This measurement relates to measurements T1, T2 and the relative air humidity.

The environmental air is measured with the combination probe and the dewpoint Td is calculated from its status.

Now surfaces in this environmental air can be measured with the surface probe, wherein ΔT_d indicates the temperature difference from the dewpoint.

Example:

The measurement of the room air provides a Td of 5 °C. As long as the surface temperature of a pane is >5 °C (ΔT_d is positive), the pane is not misted over. If the surface temperature is less than 5 °C (ΔT_d is negative), the pane will mist over.

Additional application examples:

Locating damp corners, monitoring of heat exchangers or weather forecasting.

6.3 Measurements with the STS 005 / STS 020 flow measuring probes

There are two types of measuring probes available for measurement of flow speed:

- STS 005 measures the flow of water
- STS 020 measures the flow of air

When used incorrectly, the measurement result is unusable!

Observe maximum measuring ranges!

- STS 005: 0.05 .. 5.00 m/s (water)
- STS 020: 0.5 .. 20.00 m (air)

Higher speeds can destroy the measuring head or at least permanently impair the measuring accuracy. The specified flow direction is marked with an arrow on the measuring head.

Flow measuring probes are free-jet calibrated, i.e. the diameter of the flow channel to be measured must be at least 5 times the diameter of the flow measuring head. Approx. 5 cm, otherwise there will be a measuring error of up to 40%!

When evaluating the measurement results, also observe that the flow speed in the middle of a channel is higher than at the edge of the channel. There are relevant tables for calculation of the airflow rate based on the flow speed.

6.3.1 Averaging processes for flow measurement

Significant measurement fluctuations usually occur with measurements of flows. Two averaging processes can be integrated in order to display a stable measurement:

6.3.1.1 Continuous averaging

This displayed average is calculated from the last measurements over the time period of the adjusted averaging time and displayed. After the device has been switched on, the remaining time until the averaging time has expired is displayed in the lower display line. The Min and Max values are based on the smallest and largest displayed average.

6.3.1.2 Averaging at the push of a button (Average Hold)

After the product is switched on, it begins to generate the average of the flow measurement for the duration of the averaging time. The current measurement appears in the main display during the measurement and the remaining measuring time appears in the secondary display. After the measurement is completed, the average is displayed and the product switches to HOLD mode. The Min and Max values are based on the smallest and largest measurement while the average is being calculated.

The *store* button must be pressed to start a new measurement.

6.3.2 Additionally with optional Typ-K temperature probe on T2

The temperature of the medium, for example, can be measured with temperature channel T2. The unaveraged measurement is display.

6.4 Universal output

The output can be used as a serial interface (for USB 3100, USB 3100N, GRS 3100 or GRS 3105 interface converters). If the output is not required, it should be deactivated, *OUT OFF*. The battery consumption will be drastically reduced as a result.

6.4.1 Interface

The product can be connected directly to a USB interface of a PC with a galvanically isolated interface converter. Transmission takes place in a binary coded format and is protected against transmission errors with elaborate safety mechanisms (CRC).

Software:

- Standard software packages are available for purchase online at www.greisinger.de.
- A Windows function library with program examples for development of custom software is available for purchase, as well as the freely available interface description.



NOTE

The following measurement, alarm and range values output via the interface are always output based on the adjusted base address.

Supported interface functions:

Channel as- signment						Code	Name/function
1	2	3	4	5	6		
X	X	X	X	X	X	0	Read current value
X	X	X				3	Read system status
X						12	Read ID number
1	1	1	1	1	1	22	Read Min. alarm limit
1	1	1	1	1	1	23	Read Max. alarm limit
2						32	Read configuration flag
2						160	Set configuration flag
X	X	X	X	X	X	199	Read measurement type display
X	X	X	X	X	X	200	Read minimum display range
X	X	X	X	X	X	201	Read maximum display range
X	X	X	X	X	X	202	Read display range unit
X	X	X	X	X	X	204	Read display range decimal point
X						208	Read number of channels
	X	X				216	Read offset
		X				218	Read correction factor
X						240	Sensor module reset
X						254	Read program identification

1 = Only possible when alarm is activated for the relevant channel.

2 = Available configuration flags 50: 0 = Logger off; 1 = Logger on.

= Available configuration flags 51: 0 = Manual logger; 1 = Cyclical logger.

6.4.2 Channel assignment

The assignment of channels depends on which temperature probe or sensor is connected to the product.

TFS 0100E

Channel 1	Relative air humidity
Channel 2	Temperature T1
Channel 3	Temperature T2
Channel 4	Dewpoint temperature Td
Channel 5	Dewpoint distance ΔT_d
Channel 6	Enthalpy h

STS 005 / 020

Channel 1	Flow speed
Channel 2	Not supported. (NoAck or error code)
Channel 3	Temperature T2
Channel 4	Not supported. (NoAck or error code)
Channel 5	Not supported. (NoAck or error code)
Channel 6	Not supported. (NoAck or error code)

Temperature probe Typ-K without TFS / STS

Channel 1	Not supported. (NoAck or error code)
Channel 2	Not supported. (NoAck or error code)
Channel 3	Temperature T2
Channel 4	Not supported. (NoAck or error code)
Channel 5	Not supported. (NoAck or error code)
Channel 6	Not supported. (NoAck or error code)

6.4.3 Analogue output



NOTE

The analogue output cannot be used for data logger recording.

An analogue voltage of 0-1V can be tapped at a product output if it is correctly adjusted. Configuring parameters of the configuration menu [► p. 14].

The analogue output can be scaled very easily with $dRC.U$ and $dRC.I$.

It must be ensured that the analogue output is not overloaded. Otherwise the output value can be falsified and the current consumption of the product increases accordingly. Loads of up to approx. 10k Ohm are harmless.

- If the display exceeds the value adjusted with $dRC.I$, 1V is output.
- If the display undercuts the value adjusted with $dRC.U$, 0V is output.
- A voltage slightly above 1V is output at the analogue output in case of an error. Error and system messages [► p. 32].

7 Data logger

7.1 Basics of the data logger

The product has two different data logger functions:

Func-Store

If you press the *store* button, a measuring result, an individual value and a measurement point ID are recorded.

Func-Cycle

If you press and hold the *store* button for 2 seconds, the data records are recorded automatically in the adjusted time cycle.

For evaluation of the data, you need the GSOFT3050 software with which the data logger can also be started and adjusted easily. The Hold function is not available when the data logger function is activated. You control the data logger functions with the *store* button.



NOTE

The sensor must not be changed after saving measurements. Otherwise, invalid data will be read and the display will show *SEN5 Error* or *Err9*.

Configuring parameters of the configuration menu [► p. 14]

7.2 *Func Store*

If the *set* button is pressed and held for 2 seconds, the stored data records are viewed in the main display. When the configuration is opened, an additional menu item appears in the **Configuration** menu. *READ LOG* is also displayed. The stored values can also be read on a PC with use of the interface.

Configuring parameters of the configuration menu [► p. 14]



NOTE

Up to 1000 data records can be stored.

Logger data record:

Channel assignment [► p. 22]

Start data logger recording:

Prerequisite

- The product is switched on.
- A suitable temperature or measuring sensor is plugged in.

Instruction

1. Press the *store* button for <1 second to start the data logger recording.
2. *St* appears in the display. And the storage number is displayed. Then *L-ID* appears in the secondary display.
3. Press the *max* button and the *min* button to assign the measuring points. This can be a number from 0 .. 9999.
4. The entry is confirmed with the *store* button.

Outcome of an action The measurement result appears briefly in the main display after the storage process. `LOG FULL` appears if the logger buffer is full. The data logger recording is stopped automatically.

Open data logger recording:

Prerequisite – The data logger recording has been started and at least one data logger recording is available. If no data logger recordings are available, `SET CONF` appears.

Instruction

1. Press the `set` button for 2 seconds to open the data logger recordings.
2. `READ LOG` appears in the display.
3. You can switch between measurements, measuring point and date/time display of the data record with the `cal` button. You can switch between data records with the `max` button and the `min` button.

Outcome of an action The display is stopped with the `store` button.

Delete data logger record:

Prerequisite – At least one data logger record is present.

Instruction

1. Press the `store` button for 2 seconds to delete the data logger conditions.
2. You can switch between individual selection options with the `max` button and the `min` buttons. Confirm your selection with the `store` button.

<code>CLR ALL</code>	Delete all data records
<code>CLR LAST</code>	Delete the last recorded data record
<code>CLR no</code>	Delete nothing

Outcome of an action The data logger records have been deleted.

7.3 Func CYCL

Once the data logger has been started with the `store` button, data records are recorded until the recording has either been stopped or the logger buffer is full. This does not apply with STS and AVG Hold.



NOTE

Up to 5300 data records can be stored. The data logger cycle time can be adjusted from 0:01 .. 60:00 min.

Logger data record:

Channel assignment [► p. 22]

Start data logger recording:

Prerequisite – The product is switched on.
 – A suitable temperature or measuring sensor is plugged in.

Instruction

1. Press the `store` button for 2 seconds to open the data logger conditions.
2. `LOG RUN` appears in the display.
3. Press the `store` button again to start the data logger recording.

Outcome of an action The data records are shown in the display after each recording. `LOG FULL` appears if the logger buffer is full. The data logger recording is stopped automatically.

Stop data logger recording:

Prerequisite

- The data logger recording has been started.

Instruction

1. Press the *store* button for <1 second to stop the data logger recording.
2. *STOP no* or *STOP YES* appears in the display.
3. You can switch between two points with the *max* button and the *min* buttons. The selection is acknowledged with the *store* button.

Outcome of an action

If *STOP YES* has been selected, the data logger recording is stopped.

**NOTE**

IF the product attempts to switch off during a data logger recording, a query asking whether it should be stopped appears automatically. The product can only be switched off after the data logger recording has been stopped. The Auto-Power-Off function is deactivated while the data recording is running.

Delete data logger record:

Prerequisite

- At least one data logger record is present.
- The data logger recording has been stopped.

Instruction

1. Press the *store* button for 2 seconds to open the data logger conditions.
2. *LOG run* appears in the display.
3. Press the *max* button or the *min* button. *LOG CLR* appears in the display.
4. Press the *store* button again. The display shows *CLR.no*.
5. You can switch between individual selection options with the *max* button and the *min* buttons. Confirm your selection with the *store* button.

<i>CLR.ALL</i>	Delete all data records
<i>CLR.LAST</i>	Delete the last recorded data record
<i>CLR.no</i>	Delete nothing

Outcome of an action

The data logger records have been deleted.

8 Operation and maintenance

8.1 Operating and maintenance notices



NOTE

Plugs and sockets must be protected from soiling.



NOTE

If the product is stored at a temperature above 50 °C, or is not used for an extended period of time, the batteries must be removed. Leaks from the batteries are avoided as a result.



NOTE

The product, measuring sensor and temperature probe must be handled with care and used in accordance with the technical data. Do not throw or strike. Contaminants can influence the measurement negatively. Use of an unsuitable measuring sensor or temperature probe can damage said devices or the product.



NOTE

The product must be switched off to change the measuring sensor, the temperature probe, electrode, interface or mains adaptor. It must not be disconnected by pulling the cable; pull the plug only.

8.2 Battery

8.2.1 Battery indicator

If the **bAt** display text appears in the main display, the battery voltage is no longer adequate for operation of the product. The battery is fully depleted.

If **bAt** appears in the display with a warning triangle, the battery is low and should be replaced soon. However, the device will still operate for a certain length of time.

8.2.2 Changing battery

Description	Proceed as follows to replace the batteries.
Prerequisites	– The product is switched off.
Instruction	<ol style="list-style-type: none"> 1. Open the cover of the product by carefully pushing it back and away from the product. 2. Pull the battery out of the compartment and disconnect it. 3. Ensure correct polarity when replacing the battery! 4. Insert the battery in the compartment. Then position the cover correctly and slide it in until it engages.
Outcome of an action	The product is now ready for use again.

8.3 Relative air humidity measurement adjustment

Due to the natural ageing of the polymer humidity sensor of the TFS 0100E, readjustment the probe at least once annually is recommended in order to guarantee optimal measurement accuracy. The product can be sent in to the manufacturer for precise re-adjustment with linear control. A adjustment function is integrated for 2-point local adjustment.

8.3.1 General information for adjustment

Automatic calibration

The following humidity measurement standards are permitted for automatic buffer recognition:

Name	Relative air humidity at 20° C	Calibration device
KNO ₃	93%	---
NaCl	76%	GFN 76
MgCl ₂	33%	GFN 33
Silica gel	0%	---

The GFN xx adjustment devices are optimised for the application with the TFS 0100E. Only these humidity measurement standards are recommended in order to obtain the most exact adjustment possible. Refer to the accompanying instructions for the exact use and handling.

If a value of > 50% has been selected for adjustment point 1, a value < 50% must be used for adjustment point 2. If the value for adjustment point 1 is < 50%, the value for adjustment point 2 must be > 50%.

Manual adjustment

Arbitrary values between 0% and 100% r.H. can be used. However, the difference between the two values must be at least 40%.

Automatic temperature compensation for the adjustment

The relative air humidity adjusted in the adjustment devices is partly heavily dependent on temperature. When adjustment with the specified adjustment devices, recognition takes place automatically and this dependency is compensated for automatically. If adjustment values are entered manually, it must be ensured that the relevant values are entered for the appropriate temperature.



NOTE

Adjustment is only possible in the temperature range of 5 °C .. 40 °C.

Permissible sensor deviation

Adjustment is only possible if the deviation of the humidity sensor is less than approx. +/- 10% r.H.. If the deviation is greater, the main display of the product shows the error message *Err9* for approx. 2s and the secondary display shows the detected humidity value. Then the stability test restarts.

In this case, please check your humidity standard. If it is correct, it must be assumed that the sensor no longer functions correctly. Please send the product to the manufacturer for testing.

Stability criterion

- The humidity value does not change by more than 0.5% r.H. within 20s.

- Temperature T1 does not change by more than 0.5 °C within 20s.

8.3.2 Automatic adjustment

Description	If the preset humidity standards are used, automatic adjustment must be selected. General information for adjustment [► p. 28]
Prerequisite	<ul style="list-style-type: none"> – The product is switched on. – A suitable TFS 0100E sensor must be connected.
Instruction	



NOTE

Adjustment can be interrupted at any time with the *set* button. In this case, the existing adjustment remains in effect.



NOTE

If you press and hold the *cal* button for 10 seconds, the device will be reset to the factor adjustment.

1. If you press the *cal* button for 2 seconds, *R.Pt. 1* will appear in the secondary display.
2. If the main display switches between the individual values, no valid, stable value has been recognised. Observe the stability criteria in the chapter General information for adjustment [► p. 28].
3. If the error message *Err 9* briefly appears, observe the permissible sensor deviation in the chapter General information for adjustment [► p. 28].
4. Once the display no longer blinks and no longer switches, a valid and stable value has been found and can be adopted with the *store* button.
5. *R.Pt. 2* appears in the secondary display. Now insert the TFS0100E sensor into the calibration device for the second humidity value. Observe the permissible calibration points in the chapter General information for adjustment [► p. 28].
6. If the main display switches between the individual values, no valid, stable value has been recognised. Once the display no longer blinks and no longer switches, a valid and stable value has been found and can be adopted with the *store* button.
7. The product restarts and switches to normal operating mode.

Outcome of an action The product is now adjusted.

8.3.3 Manual adjustment

Description	If values other than those provided in the automatic adjustment should be used, manual adjustment must be selected.
Prerequisite	<ul style="list-style-type: none"> – The product is switched on. – A suitable temperature probe or sensor is connected.
Instruction	



NOTE

Adjustment can be interrupted at any time with the set button. In this case, the existing adjustment remains in effect.

If you press and hold the *cal* button for 10 seconds, the device will be reset to the factor adjustment.

1. Press and hold the *cal* button for 2 seconds and then press the *cal* button again so that *Pt. 1* appears in the secondary display.
2. The value of the buffer is adjusted with the *max* button and the *min* button. Observe the permissible temperature compensation for the adjustment in the chapter General information for adjustment [▶ p. 28].
3. A valid, stable value has not been recognised as long as the display is blinking. Observe the stability criteria in the chapter General information for adjustment [▶ p. 28].
4. Once the display no longer blinks, a valid and stable value has been found and can be adopted with the *store* button.
5. If the error message *Err9* briefly appears, observe the permissible sensor deviation in the chapter General information for adjustment [▶ p. 28].
6. If no error message appears, the value has been adopted successfully and the second adjustment point can be entered.
7. *Pt. 2* appears in the secondary display. Now insert the TFS0100E sensor into the adjustment device for the second humidity value. Observe the permissible adjustment points in the chapter General information for adjustment [▶ p. 28].
8. The value is adjusted with the *max* button and the *min* button. Observe the permissible temperature compensation for the adjustment in the chapter General information for adjustment [▶ p. 28].
9. A valid, stable value has not been recognised as long as the display is blinking. Observe the stability criteria in the chapter General information for adjustment [▶ p. 28].
10. Once the display no longer blinks and no longer switches, a valid and stable value has been found and can be adopted with the *store* button.
11. If the error message *Err9* briefly appears, observe the permissible sensor deviation in the chapter General information for adjustment [▶ p. 28].
12. If no error message appears, the value has been adopted successfully. The product restarts and switches to normal operating mode.

Outcome of an action

The product is now adjusted and ready for measurement.

8.4 Certificates

The certificates are categorised as ISO calibration certificates and DAkkS calibration certificates. The purpose of the calibration is to verify the precision of the measuring device by comparing it with a traceable reference.



NOTE

The ISO standard 9001 is applied for the calibration certificates. These certificates are an affordable alternative to the DAkkS calibration certificates and provide information of the traceable reference, a list of individual values and documentation.

**NOTE**

The DAkkS calibration is based on DIN EN ISO/17025, the accreditation basis recognised worldwide. These certificates offer high-quality calibration and consistently high quality. DAkkS calibration certificates can only be issued by accredited calibration laboratories which have demonstrated their expertise in accordance with DIN EN ISO/IEC 17025. The DAkkS calibration includes any necessary adjustment with the purpose of minimising a deviation of the measuring device.

DAkkS calibration certificates are accompanied with a list of individual measurements before and after the adjustment, documentation and, if applicable, graphic representation, calculation of the expanded measuring uncertainty and traceability to the national standard.

**NOTE**

The product is delivered with a test report. This confirms that the measuring device has been adjusted and tested.

**NOTE**

Only the manufacturer can check the basic settings and make corrections if necessary.

9 Error and system messages

Display	Meaning	Possible causes	Remedy
<i>SEN5 Error</i>	No probe or sensor connected Sensor or probe defect Measuring range exceeded or undercut	Sensor or probe missing Defective sensor or probe Incorrect sensor type selected	Connect sensor or probe Connect different sensor or probe Readjust measuring range
No display, unclear characters or no response when buttons are pressed	Battery depleted System error Product is defective	Battery depleted Error in the product Product is defective	Replace battery Send in for repair
<i>bAt</i> blinks	Battery low	Battery low	Replace battery
<i>bAt</i>	Battery depleted	Battery depleted	Replace battery
<i>CP.L Err.1</i>	Zero point calibration defective		
<i>Err.1</i>	Measuring range exceeded	Measurement too high Measuring probe, sensor or product defect	The measurement is above the permissible range Test measuring probe or sensor Send in for repair
<i>Err.2</i>	Measuring range is undercut	Measurement too low Measuring probe, sensor or product defect	The measurement is below the permissible range Test measuring probe or sensor Send in for repair
<i>Err.3</i>	Display range has been exceeded	Value is too high	Adjust measuring range
<i>Err.4</i>	Display range has been undercut	Value is too low	Adjust measuring range
<i>Err.7</i>	System error	Error in the product	Switch the product on/off Replace batteries Send in for repair
<i>Err.9</i>	Sensor/probe not available Sensor/probe error	Sensor/probe not connected Sensor/probe defect	Switch the product on/off Connect sensor/probe New sensor/probe
<i>Err.11</i>	Measurement value could not be calculated	Measurement variable not available Incorrect unit setting	Change/adjust measurement variable Enter suitable unit

10 Disposal

Separation by material and recycling of device components and packaging must take place at the time of disposal. The valid regional statutory regulations and directives applicable at the time must be observed.



NOTE

The device must not be disposed of with household waste. Return it to us, freight pre-paid. We will then arrange for the proper and environmentally-friendly disposal.

Private end users in Germany have the possibility of dropping off the product at the municipal collection centre.

Please dispose of empty batteries at the collection points intended for this purpose.



NOTE

Fill in the return form available from the information base online at www.ghm-group.de and sent it in with the product.

11 Technical data

Measuring ranges with probe TFS 0100E	Humidity	0.0 .. 100.0 % relative air humidity
	Room temperature (T1)	-40.0 .. +120.0 °C
	Surface temperature (T2)	-80.0 .. +250.0 °C
Calculated variables	Dewpoint temperature	-40.0 .. +70.0 °C
	Dewpoint distance	-200.0 .. +290 °C
	Enthalpy	0.0 .. 250.0 kJ/kg
Measuring range with probe STS 005 and/or STS 020	Flow speed	See probe for measuring range
	Surface temperature (T2)	-80.0 .. +250.0 °C
Device accuracy (± 1Digit) (at nominal temperature)	Relative air humidity	± 0.1%
	Room temperature	± 0.2 °C
	Surface temperature	±0.5 % of measurement ±0.5 °C
	Flow speed	± 0.1 %
Surface temperature input (T2)	Reference junction	± 0.5 °C
	Temperature drift	0.01 %/K
Flow speed	Average determination	1 .. 30 s
Operating conditions		-25 .. +50 °C; 0 .. 95 % r.H. (non-condensing)
Nominal temperature		25 °C
Storage temperature		-25 .. +70 °C
Connections	TFS 0100E and STS...	6-pole mini-DIN socket with a maximum cable length of < 10 m
	Surface temperature	Miniature flat plug connector for type K thermocouple with a maximum cable length of < 3 m
	Interface, analogue output	serial, (3.5 mm jack socket), via galvanically isolated interface converter GRS3100, GRS3105 or USB3100 (accessory) that can be connected directly to the RS232 or USB interface of a PC; alternative option: analogue output 0-1 V with a maximum cable length of < 3 m
	ext. Power supply	Mains adapter socket (Ø1.9 mm inner pin) for external 10.5 .. 12 V DC voltage supply (suitable mains device: GNG10/3000) with a maximum cable length of < 3 m
Display		4-digit 7-segment (main and secondary display) with additional symbols
Data logger		Real-time clock Cyclical: 5300 data records, selectable cycle: 1 s .. 60 min Single: 1000 data records with measuring point input
Housing		Break-proof ABS housing
	Protection rating	Front-side IP65
	Dimensions,	142 x 71 x 26 mm (L x W x H)
	Weight	approx. 170 g (incl. battery)
Current supply		9 V battery, (included in the scope of delivery) or external power supply
Current requirement		Approx. 2.5 mA (incl. TFS 0100E)
Directives and standards		The devices conform to the following Directives of the Council for the harmonisation of legal regulations of the Member States: 2014/30/EU EMC Directive

2011/65/EU RoHS

Applied harmonised standards:

EN 61326-1:2013 Emission limits: Class B

Immunity according to Table 1

Additional error: < 1 % FS

When using the analogue output at acquisition equipment with earth contact increased EMI susceptibility may appear

EN 50581:2012

12 Spare parts and accessories

A selection of spare parts and accessories for this product is listed below.

Article

Number	Name	Description
600273	GNG 10/3000	Plug/mains adapter
601092	USB 3100 N	Interface converter, galvanically isolated
601336	GSOFT 3050	Software for adjustment, reading data and printing the stored logger data of products of the GHM 3000 series with logger function
601132	GOF 400VE	Quick-response surface probes for walls, floors etc.
601074	ST-RN	Protective sleeve with punched sensor connections
601062	GKK 3600	Case with nap foam
601488	TFS 0100E	Air humidity / temperature probe
603438	TFS 0100E-POR	Air humidity / temperature probe with plastic pore filter
602396	STS 005	Flow / measuring probe
602397	STS 020	Flow / measuring sensor with snap-on head
601097	GRS 3100	Interface converter
601099	GRS 3105	5-fold interface converter, incl. 9-pole Dsub extension cable and 5 type VEKA 3105 connecting cables

A complete list of all accessories and spare parts is available in our product catalogue or on our home page. We can also provide further information by phone.

Contact

Internet:www.greisinger.de

Tel: +49 94029383-52

13 Service

13.1 Manufacturer

If you have any questions, please do not hesitate to contact us:

Contact GHM Messtechnik GmbH
GHM GROUP - Greisinger
Hans-Sachs-Str. 26
93128 Regenstauf | GERMANY
Email: info@greisinger.de | www.greisinger.de
WEEE reg. no. DE 93889386



13.2 Repairs processing

Defective products are repaired professionally and quickly in our service centre.

Open hours and contact Monday to Thursday from 8:00 to 16:00
Friday from 8:00 to 13:00
GHM Messtechnik GmbH
GHM GROUP - Greisinger
Hans-Sachs-Str.26
Service Centre
93128 Regenstauf | GERMANY
Tel: +49 94029383-39
Fax: +49 94029383-33
service@greisinger.de



NOTE

Fill in the return form available from the information base online at www.ghm-group.de and sent it in with the product.

13.3 Sales offices

North Sales Office

Post code: 00000 – 25999 | 27000 – 34999
37000 – 39999 | 98000 – 99999
Email: vertrieb-nord@ghm-messtechnik.de
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West Sales Office

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40000 – 69999
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