EN

G 1781

High precision reference thermometer
with micro-probe

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1   About this documentation

1.1   Foreword

Read this document carefully and familiarise yourself with the operation of the device before you use it.

Keep this document ready to hand and in the immediate vicinity of the device so that it is available to the personnel/user for reference at all times in case of doubt.

The user must have carefully read and understood the operating manual before beginning any work.

1.2   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 device.

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.

1.3   Further information

Software version of the device:

– V1.2 or later

For the exact product name, refer to the type plate on the rear side of the device.

> ⊙ **NOTE**

For information about the software version, press and hold the ON button to switch on the device for longer than 5 seconds. The series is shown in the main display and the software version of the device is shown in the secondary display.

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.

❶ **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 device can only be guaranteed if 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 device, personal injury and property damage, the device must be used exclusively as described under intended use.

  – Do not use in safety / Emergency Stop devices!

  – The device is not suitable for use in explosion-prone areas!

  – **The device must not be used for diagnostic or other medical purposes on patients!**

  – Not suitable for use with requirements on functional safety, e.g. SIL!

2.3   Safety instructions

> ⚠ **CAUTION**

Empty batteries and batteries of inferior quality can leak more easily, which can destroy the device. Please also observe the instructions in the chapter "Operation and maintenance".

> ⚠ **DANGER**

There is an immediate danger to life if live parts come into contact with the temperature sensor!
Therefore, do not conduct measurements on or in the direct vicinity of live parts or lines.

> ❶ **NOTE**

This device does not belong in children's hands!

> **NOTE**

The sensor handle, connecting cable and device housing are not designed for continuous contact with foods.

2.4   Intended use

The G 1781 is a high-precision reference thermometer for checking outer products, where the highest accuracy is required.
The miniaturized probe is designed to be inserted in appropriate reference bores and to measure on site quickly and without distortion.

It is additional to the reference application designed for precise and instantaneous temperature measurements in the following media:

– Gases
– Soft plastic materials

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. 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   The device at a glance

LCD Display   *Front view*

3.1   Display elements

 Battery indicator   Evaluation of the battery status

 Unit display   Display of units or type of mode, min/max/hold

 Main display   Measurement of the current temperature or value for min/max/hold

 Auxiliary display   Measurement of the current temperature in min/max/hold mode with unit

3.2   Connections

Probe   Permanently connected sensor

⊘ NOTE

The device series is a water-protected thermometer.
However the temperature sensor of the G 1781 is not designed for permanent complete immersion in liquids

3.3 Operating elements

On / Off button

Press briefly	Switch on the device
	Activate / deactivate lighting
Long press	Switch off the device
	🔲 Reject changes in a menu

Up / Down button

Press briefly	▶ Display of the min/max value
	🔲 Change value of the selected parameter
Long press	▶ Reset the min/max value of the current measurement
Both simultaneously	▶ Rotate display, overhead display

Function button

Press briefly	▶ Freeze measurement (Hold)
	🔲 Call up next parameter
Long press, 2s	▶ Start menu "configuration", *ConF* appears in the display

Operating status   ▶   *device is in measured value displunitay*

            🔲   *device is in a menu*

4 Operation

4.1 Opening the configuration menu

1. Press the *Function key* for 2 seconds to open the **Configuration** menu.

2. ⌐⍽⎇⍭ appears in the display. Release the *Function key*.

Parameter	Values	Meaning
▶	▲ ▼	
⍴⎍.	**Alarm**	
	⍽⎎⎎	No alarm active
	⍽⍵	Alarm via text insertion, acoustic signal and flashing of the background lighting
	⎙⎒⎒⍴	Alarm via text insertion and acoustic signal
	⎍⍳ ⎇⎒	Alarm via text insertion and flashing of the background lighting
⍴⎍.⎍⍽	**Min. alarm limit** *(only available if AL <> off)*	
	0.00 .. ⍴⎍.⎎⍳	a min. alert is triggered if the value falls below this value. (at °F: 32.00 .. AL.Hi)
⍴⎍.⎎⍳	**Max. alarm limit** *(only available if AL <> off)*	
	⍴⎍.⎍⍽ .. 80.00	If the value is exceeded, a max. alarm is triggered. (at °F: AL.Hi .. 176.00)
⍴⍽⎎⎎	**Shut-off time**	
	⍽⎎⎎	No automatic shut-off
	15, 30, 60, 120, 240	Automatic shut-off after a selected time in minutes, during which no buttons have been pressed

Li tE	**Backlight**	
	oFF	Backlight deactivated
	15, 30, 60, 120, 240	Automatic shut-off of the backlight after a selected time in seconds, during which no buttons have been pressed
	on	No automatic shut off of the backlight
Uni t	**Display unit**	
	°C	Temperature display in °C
	°F	Temperature display in °F
Hi rE	**Display resolution**	
	no	Resolution = 0.1°
	YES	Resolution = 0.01°
Ini t	**Factory settings**	
	no	Use current configuration
	YES	Reset device to factory settings. After confirming with the *function-button*, the display shows: Ini t donE

4.2 Adjustment of the measuring input

The temperature input can be adjusted with the zero point correction and the gradient correction. If an adjustment is made, you change the pre-adjusted factory settings.

This is signalled with the display text t.oF or t.SL when switching on.

1. Switch the device off.
2. Hold the *down button* and press the *On/Off button* briefly to switch on the device and open the **Adjustment** menu.
3. The display shows the first parameter. Release the *down button*.

Parameter	Values	Meaning
▶	▲ ▼	
t.oF	**Zero point correction**	
	0.00	No zero point correction
	-5.00 … 5.00	Zero point correction in °C. (at °F -9.00 .. 9.00)
t.SL	**Gradient correction of the temperature**	
	0.00	No gradient correction of the temperature
	-5.00 … 5.00	Gradient correction in %

Formula used by device:

Temperature = °C: Display = (measured value - t.oF) * (1 + t.SL / 100)

Temperature = °F: Display = (meas. value - 32 °F - t.oF) * (1 + t.SL / 100) + 32 °F

Adjustment example:

Temperature unit= °C, the adjustment is carried out in 2 separate steps at 0 °C (e.g. ice water) and at a reference temperature (e.g. clinical thermometer with water bath 37 °C).- First set the values of t.oF and t.SL in the adjustment menu to 0

Zero point: - Set the temperature probe to 0 °C and let it adjust.
- Start the adjustment menu and enter the display value at 0 °C for t.oF
- After leaving the menu, the device should now display 0.0 °C.

Slope: - Set the temperature sensor to the reference temperature and let it adjust.
- Calculate slope correction: $t.SL = \left(\frac{reference\ temperature}{display} - 1 \right) * 100$
- Start adjustment menu and enter the calculated value at t.SL
- Exit menu, the device should now display the reference temperature.

5   Measurement Basics

5.1   Possible measuring errors

5.1.1   Immersion depth

Gas: Immerse as far as possible into the gas to be measured so that the measuring sensor is subjected to a heavy flow.

5.1.2   Surface effects and poor heat transfer

Special measuring sensors are required for this purpose. Surface characteristics, design of the measuring sensor, heat transfer and environmental temperature influence the measurement result.

NOTE: Thermally conductive paste between the measuring sensor and surface can also in-crease measurement accuracy in some cases.

5.1.3   Cooling / evaporation

When measuring the air temperature, the probe should be dry, otherwise the temperature measured will be too low.

5.1.4   Response time

An adequate wait time must be observed for the measuring process before reading the measured value. The response time T_{90} describes the time in which the displayed measured value reached 90% of the end value.

6 Operation and maintenance

6.1 Operating and maintenance notices

> ⓘ **NOTE**

The device and temperature probe must be handled with care and used in accordance with the technical data. Do not throw or strike.

> ⓘ **NOTE**

Plugs and sockets must be protected from soiling.

> ⓘ **NOTE**

If the device 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.

6.2 Battery

6.2.1 Battery indicator

If the empty frame in the battery display blinks, the batteries are depleted and must be replaced. However, the device will still operate for a certain length of time.

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

6.2.2 Changing battery

> ⚠ **DANGER**

Danger of explosion!

Using damaged or unsuitable batteries can generate heat, which can cause the batteries to crack and possibly explode!

– Only use high-quality and suitable alkaline batteries!

⚠ **CAUTION**

Damage!

If the batteries have different charge levels, leaks and thus damage to the device can occur.

– Only use high-quality and suitable alkaline batteries!

– Do not use different types of batteries!

– Remove depleted batteries immediately and dispose of them at a suitable collection point.

🛈 **NOTE**

Unnecessary unscrewing endangers the protection against moisture and should therefore be avoided.

🛈 **NOTE**

Read the following handling instructions before replacing batteries and follow them step by step.
If disregarded, the device could be damaged or the protection from moisture could be diminished.
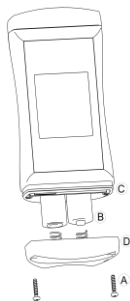
1. Unscrews the Phillips screws (A)and remove the cover.

2. Carefully replace the two Mignon AA batteries (B). Ensure that the polarity is correct! It must be possible to insert the batteries in the correct position without using force.

3. The O-ring (C) must be undamaged, clean and positioned at the intended depth.

4. Fit the cover (D) on evenly. The O-ring must remain at the intended depth!

5. Tighten the Phillips screws (A).

7   Error and system messages

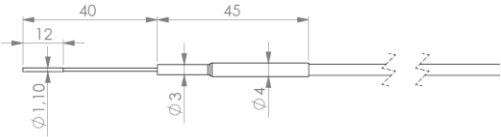| Display	Meaning	Possible causes	Remedy
----	Measurement far outside of the measuring range	Measurement outside of the measuring range	Stay within allowable measurement range
		Probe or device defect	Send in for repair
	Sensor cable or probe defect	Measuring probe or device defect	Send in for repair
No display, unclear characters or no response when buttons are pressed	Battery depleted	Battery depleted	Replace battery
	System error	Error in the device	Send in for repair
	Device is defective		
bAt	Battery depleted	Battery depleted	Replace battery
Err.1	Measuring range exceeded	Measurement too high	Stay within allowable measurement range
		Measuring probe or device defect	Send in for repair
Err.2	Measuring range is undercut	Measurement too low	Stay within allowable measurement range
		Measuring probe or device defect	Send in for repair
SYS Err	System error	Error in the device	Switch device on/off
			Replace batteries
			Send in for repair

8 Technical data

G 1781	
Measuring range	0.00 .. +80.00 °C (32.00 .. +176.00 °F)
Accuracy	37 °C: ± 0.05 K ± 1 digit
	0 .. +80 °C: ± 0.1 K ± 1 digit
Probe	2-wire NTC special probe, fixed connected to the device

	Probe tip	Ø 1.1 x 12 mm, stainless steel
	Intermediate cable	Ø <1.0 x 27 mm, teflon
	Transition sleeve	Ø 4 x 45 mm
	Connection cable	approx. 1.2 m, PVC
Response time t$_{90}$		<10 s (air, 2 m/s)

Measuring cycle		approx. 2 measurements per second
Display		3-line segment LCD, additional symbols, illuminated (white, luminous duration adjustable)
Standard functions		Min/max/hold, alarm (optical and acoustic)
Adjustment		Offset and gradient correction
Housing		Break-proof ABS housing
	Protection rating	IP65 / IP67
	Dimensions L*W*H	108 * 54 * 28 mm, without kink protection
	Weight	~ 142 g incl. batteries and probe
Nominal temperature		25 °C
Operating conditions		-20 to 50 °C; 0 to 95 %RH (temporarily condensing)

Storage temperature	-20 to 70 °C	
Current supply	2 * AA batteries (mignon)	
	Current requirement	approx. 0,7 mA, approx. 2,5 mA with backlight
	battery life	Service life > 3000 hours with alkaline batteries (without backlighting)
	Battery indicator	4-stage battery status indicator, Replacement indicator for depleted batteries: "BAT"
	Auto-power-OFF function	The device switches off automatically if this is activated
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 A.1 Additional errors: < 1 % FS
	EN IEC 63000:2018	
	The device is intended for mobile use and/or stationary operation in the scope of the specified operating conditions without further limitations.	

9 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.

① NOTE

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

Private end users in Germany have the possibility of dropping off the device at the municipal collection centre. Batteries must be removed beforehand!

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

10   Service

10.1   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

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10.2   Calibration and adjustment service

The purpose of the calibration is to verify the precision of the measuring device by comparing it with a traceable reference.

Both ISO calibration certificates and DAkkS calibration certificates are available from Greisinger.

> ⓘ **Explanation**

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

The DAkkS calibration is based on DIN EN ISO/17025, the accreditation basis is recognised worldwide. These certificates offer high-quality calibration and consistently high quality. The DAkkS calibration includes any necessary adjustment with the purpose of minimising a deviation of the measuring device.

> ⓘ **NOTE**

The device is delivered with a test report.
This confirms that the measuring device has been adjusted and tested, without making any statement about the accuracy of a temperature sensor.

> ⓘ **NOTE**

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