INSTRUCTION MANUAL

Digital Quick Response Thermometer
Type J/K/N/S/T HM 210

B+B
SENSORS

Content

CE

INSTRUCTION MANUAL

Foreword
Dear customer,

We thank you for having purchased the Precision-Second-Thermometer HM 1170 and we are very glad that you decided a product of **B+B Thermo-Technik GmbH**. We hope this product will fully satisfy you and will assist you effectively in your work.

This Device has been developed to be technically highly up-to date. This product has been designed in accordance with the regnant European and German national directives and rules. For a proper and effective usage of the product the customer shall observe the following Operating Instructions. In the case that against one's expectations any trouble occurs which you can not resolve yourself, please contact our service centers or our authorized dealer. We will provide you rapid and competent help to minimize the risk of long time outfalls.

The following operating Instruction is an indispensable part of this Product. It contains important advices for the starting up and further use of the device.

General Information
This Operation Manual is intended to serve as an aid in the proper setup, installation and operating of the B+B product.

All essential details of the equipment and all actions required on the part are clearly presented and explained. We thus ask that you read this manual carefully before proceeding to work with the equipment. Keep this manual available for ready reference in a convenient and conspicuous location near the equipment.

Symbols Employed

Sign	Meaning	Notice
	Advice	It is necessary to read the following advices before using the product. The used symbols in the manual acts first of all as eye catcher for security risks. The symbols do not replace the security advices. The text must be read completely.
	Necessarily to observe	This symbol designates important advices and tips which are necessary for the success of a procedure. They have to be followed in order to get good results.

Warning Signs

Warning Signs	Meaning
	This symbol advises the user of danger for persons, material or environment. The text gives information that must be necessarily followed to avoid any risks
	Caution against hot surfaces (BGV A8, GUV-V A8/W26) and hot liquids or substances
	Caution against liquids and hot substances
	Caution against dangerous explosive substances (BGV A8, GUV-V A8/W02)
	Caution against moving maschines (W29) Caution against moving parts
	Caution against electromagnetic fields (BGV A8, GUV-V A8/W12)
	Caution against severe cold (BGV A8, GUV-V A8/W17)

Technical changes reserved

B+B Thermo-Technik GmbH | Heinrich-Hertz-Straße 4 | D-78166 Donaueschingen
Fon +49 771 83160 | Fax +49 771 831650 | info@bb-sensors.com | bb-sensors.com

2 / 12

INSTRUCTION MANUAL

⚠	Caution against dangerous high electrical voltage (BGV A8, GUV-V A8/W08)
⚠ EX	Caution against dangerous explosive atmosphere (BGV A8, GUV-V A8/W21)
⌧	Electronic waste

Safety Instructions

For damages caused by failure to observe these safety and operating instructions, B+B Thermo-Technik GmbH assumes no liability for damages.

This device has been designed and tested in accordance to 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 it.

Trouble-free operation and reliability of the device can only be guaranteed if it 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 result 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.

If device is to be connected to other devices the circuitry has to be designed most carefully. Internal connection in third party devices (e.g. connection GND and earth) may result in not-permissible voltages impairing or destroying the device or another device connected.

Warning:
Just devices with mains input: If device is operated with a defective mains power supply (e.g. short circuit from mains voltage to output voltage) this may result in hazardous voltages at the device (e.g. at sensor socket)

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 restarting. 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.

Caution:
Do not use these product 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.

Intendend Use

The use of the unit in fields other than those indicated under "SAFETY INSTRUCTIONS" is not allowed for safety reasons.
This instruction manual does not at all substitute any additional instruction manual of connected accessoriy!

Disposal
This unit has been marked in accordance with the European Device 2002/96/EC on waste electrical and electronic equipment (WEEE)
At the end of its useful operating life, dispose of the unit as electrical scrap.
Please ask either **B+B Thermo-Technik GmbH** or your specialist dealer for information on your local collection point. Within the scope of application if this Directive, **B+B Thermo-Technik GmbH** is responsible for proper disposal of this unit

Technical changes reserved

B+B Thermo-Technik GmbH | Heinrich-Hertz-Straße 4 | D-78166 Donaueschingen
Fon +49 771 83160 | Fax +49 771 831650 | info@bb-sensors.com | bb-sensors.com

3 / 12

INSTRUCTION MANUAL

1. How to Operate And Maintain Unit

1.1 Battery Operation

- If ⚠ and „bAt" in lower display are shown, the battery has been used up and needs to be replaced. The device will, however, continue operating correctly for a certain time.

- If ´bAt´ is shown in the upper display the battery has been completely used up.

Hint: We recommend to take out battery if device is not used for a longer period of time!

1.2 Mains Operation

Attention:
- When using a power supply unit please note that operating voltage has to be 10.5 to 12 V DC. Do not apply over voltage!! Simple 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 0555 021-11.

- Prior to connecting the plug power supply with the mains supply make sure that the operating voltage stated at the power supply is identical to the mains voltage.

- Treat device and probes carefully. Use only in accordance with above specification. (do not throw, hit against etc.). Protect plugs and sockets from soiling.

- To disconnect thermocouple sensor plug do not pull at the cable but at the plug.

Selection of types of thermocouples:
- Prior to carrying out a measurement make sure to check if device is set to the thermocouple type used (type is shown on the display shortly after unit has been switched on). Unless the correct thermocouple is set, temperature measurments will be incorrect!

Selection of Output-Mode:
- The output can be used as serial interface or as analogue output. This choice has to be done in the configuration menu. If no output is needed, we recommend to switch it ‚off', the battery life then is nearly twice as long as with serial or analogue output.

2. Connections
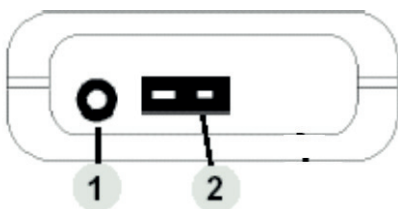
Output:
Operation as interface:
Connect to optically isolated interface adapter (accessory: GRS 3100 or GRS3105)
Operation as analogue output:
Connection via suitable cable.
Attention:
The output mode has to be configured (p.r.t 2.7) and influences battery life!
1. Probe connection
2. The **mains socket** is located at the left side of the measuring instrument.

2.1 Display Elements
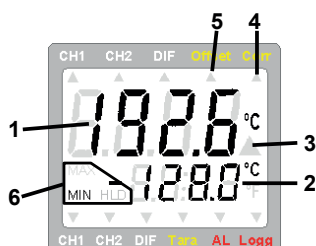
button 1 = **Main display:** Currently measured temperature
button 2 = **Secondary display:** Display of min, max or hold values

Special display elements:
button 3 = **Warning triangle:** indicates a low battery
button 4 = **Corr-arrow:** indicates that correction factor is activated
button 5 = **Offset-arrow:** indicates that zero point offset (offset) is activated.
button 6 = **Min/Max/Hold:** shows if a min., max. or hold value is displayed in the secondary display

Technical changes reserved

B+B Thermo-Technik GmbH | Heinrich-Hertz-Straße 4 | D-78166 Donaueschingen
Fon +49 771 83160 | Fax +49 771 831650 | info@bb-sensors.com | bb-sensors.com

4 / 12

INSTRUCTION MANUAL

B|B

S E N S O R S

2.2 Pushbuttons

ON OFF (1)	▲ max (2)	Tara (3)
Set Menu (4)	min ▼ (5)	Store Quit (6)

button 1: On/Off key
button 4: Set/Menu
  press (Menu) for 2 sec.: configuration will activated
button 2, 5: min/max when taking measurements:
  press shortly: min. or max. measuring value will be displayed
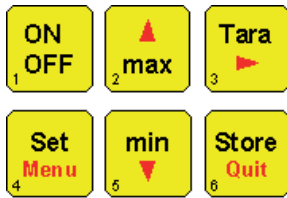 press for 1 sec.: the min. or max. value will be deleted
up/down for configuration: to enter values or change settings
button 6: Store/Quit:
  Measurement: Hold current measuring value ('HLD' in display)
  Set/Menu: Acknowledge setting, return to measuring.
button 3: no function

3. Device Configuration

For configuration of the device press **"Set"**-key (key 4) for 2 seconds, the first menu will be shown.
Choose between the individual values that can be set by pressing the **"Set"**-key (key 4) again.
The individual values are changed by pressing the keys ▲ (key 2) or ▼ (key 5).
Use key **"Store"** (key 6) to leave configuration and to store settings.

3.1 'Type': Selection of the Thermocouple-Type

ni.cr: type K, NiCr-Ni
n: type N, NiCrSi-NiSi
S: type S, Pt10Rh-Pt
t: type T, Cu-CuNi
J: type J, Fe-CuNi

3.2 'Resolution': Selection of Display Resolution (Not for Type S!)

1°: Resolution 1°C
0.1°: Resolution 0.1°C
Auto: Resolution is selected automatically

Attention: When type S is selected the resolution is always 1°C!

3.3 'Unit': Selection of Temperature Unit °C /°F

°C: All temperature values in degrees Celsius

°F: All temperature values in degrees Fahrenheit

3.4 'Corr': Selection of Display Correction Factor

0.950...1.200: The temperature value (referring to 0°C or 32°F) will be multiplied by this factor. Thus, in case of surface measurements, losses by transfer can be compensated for (>1.000). Furthermore the factor can be used to compensate probe deviations.

off: Factor deactivated (=1.000)

3.5 'Offset': Zero Displacement

-10.0°C...10.0°C
or
-18.0°F...18.0°F:
off:
The zero point of the measurement will be displaced by this value so as to compensate for deviations in the sensor and in the measuring unit.
Zero displacement deactivated (=0.0°)

Technical changes reserved

B+B Thermo-Technik GmbH | Heinrich-Hertz-Straße 4 | D-78166 Donaueschingen
Fon +49 771 83160 | Fax +49 771 831650 | info@bb-sensors.com | bb-sensors.com

CE 5 / 12

INSTRUCTION MANUAL

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

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.

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

3.7 ‚Out': Function of the Output

off: No output function, lowest power consumption
SEr: Output is serial interface
dAC: Output is analogue output 0...1V

3.8 ‚Address': Selection of Base Address when Output = Serial Interface

01, 11, 21, ..., 91: Base address for interface communication.

3.9 ‚dAC.0Volt': Output Offset When Output = Analogue Output

-220...1372°C: (depending on selected range) Input of the temperature at which 0V should be output

3.10 ‚dAC.1Volt': Output When Output = Analogue Output

-220...1372°C: (depending on selected range) Input of the temperature at which 1V should be output

4. Basics Of Thermocouple Temperature Measurements

- The right thermocouple type has to be selected prior to measuring (p.r.t. Device Configuration). Otherwise the instrment will display a wrong value! The device is optimised for type K usage.

- Temperature differences between the instrument and the probe connector may produce measuring errors, especially when using other types than type K. Therefore wait after connecting or touching the connector until the temperatures have adjusted (can take several minutes, depending on the temperature differences).

- The device is suitable to measure large temperature ranges. But consider the allowable range of the probe!

- When measuring air temperature the probe has to be dry. Otherwise the cold due to the evaporation causes too low measurings.

5. Special Functions

5.1 Display Resolution

Standard setting: ‚Auto', i.e. the device automatically switches over to the optimum resolution between 1° and 0.1°.
If temperatures to be measured are near the switching threshold, a fixed resolution may be better, e.g. for easy recording. In such a case please select the optimum resolution manually. Independent from this setting, type S measurings are always in 1° resolution!

Technical changes reserved

B+B Thermo-Technik GmbH | Heinrich-Hertz-Straße 4 | D-78166 Donaueschingen
Fon +49 771 83160 | Fax +49 771 831650 | info@bb-sensors.com | bb-sensors.com

6 / 12

5.2   Zero Displacement ('Offset')

A zero displacement can be carried out for the measured temperature:

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 offset arrow in the display.

5.3   Display Correction Factor ('Corr')

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 (standard setting: 'off' =1.000), 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:

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

5.4   Output

The output can be used as serial interface or as analogue output (0-1V). If none of both is needed, we suggest to switch the output off, battery life then is nearly doubled.

5.4.1   Interface - Base Address ('Adr.')

Using a interface converter (accessory) the device can be connected to a PC. 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 configure the base addresses accordingly. In order to avoid transmission errors, there are several security checks implemented (e.g CRC).

The following standard software packages are available for data transfer:

- **EBS9M:**   9-channel software to record and display the measuring values
  EASYCONTROL: Universal multi-channel software (EASYBUS-, RS485) for real-time recording and presentation of measuring data in the ACCESS®-data base format.

In case you want to develop your own software we offer a **development package** including

- a universally applicable 32bit Windows functions library with documentation that can be used by all 'serious' programming languages.Programmbeispiele Visual Basic 4.0™, Delphi 1.0™, Testpoint™
- Programming examples Visual Basic 6.0™, Delphi 1.0™, Testpoint™, Labview™

Note: ***The measuring and range values read via interface are always in the selected display unit (°C/°F)!***

Supported interface functions:

Code	Name/Function	Code	Name/Function
0	Read nominal value	201	Read max. display range
3	Read system status	202	Read unit of display
6	Read min. value	204	Read decimal point of display
7	Read max. value	208	Read channel count
12	Read ID-no.	216	Read offset correction
174	Delete min. value	217	Set offset correction
175	Delete max. value	218	Read corr. Factor (950..1200)

Technical changes reserved

B+B Thermo-Technik GmbH | Heinrich-Hertz-Straße 4 | D-78166 Donaueschingen
Fon +49 771 83160 | Fax +49 771 831650 | info@bb-sensors.com | bb-sensors.com
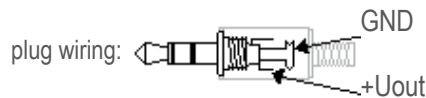
7 / 12

194	Set display unit	219	Set corr. factor (950..1200)
195	Set decimal point in display (255=Auto)	240	Reset
199	Read meas. type in display	254	Read program identification
200	Read min. display range		

5.4.2 Analogue Output – Scaling with DAC.0 and DAC.1

With the DAC.0 and DAC.1 values the output can be rapidly scaled to Your efforts.
Keep in mind not to connect low-resistive loads to the output, otherwise the output value will be wrong and battery life is decreased. Loads above ca 10kOhm are uncritical.
If the display exceeds the value set by DAC.1, then the device will apply 1V to the output
If the display falls below the value set by DAC.0, then the device will apply 0V to the output
In case of an error (Err.1, Err.2, SensErro, etc.) the device will apply slightly above 1V to the output.

plug wiring:

6. Fault and System Messages

Display	Meaning	Remedy
108 bRt	low battery voltage, device will continue to work for a short time If mains operation: wrong voltage	replace battery replace power supply, if fault continues to exist: device damaged
bAt	low battery voltage If mains operation: wrong voltage	replace battery Check/replace power supply, if fault continues to exist: device damaged
No display or weird display **Device does not react on keypress**	low battery voltage If mains operation: wrong voltage system error device defective	replace battery Check/replace power supply, if fault continues to exist: device damaged Disconnect battery or power supply, wait some time, re-connect return to manufacturer for repair
SenS Erro	Sensor error: no sensor connected sensor/cable or device defective	Connect sensor to socket return to manufacturer for repair
Err.1	Value exceeding measuring range sensor/cable defective	Check: Is the value exceeding the measuring range specified? -> temperature too high! replace
Err.2	Value below display range sensor/cable defective	Check: Is the value below the measuring range specified? -> temperature too low! replace
Err.7	system error Far out of allowable operation temperature	return to manufacturer for repair -25...50°C are allowable

Technical changes reserved

B+B Thermo-Technik GmbH | Heinrich-Hertz-Straße 4 | D-78166 Donaueschingen
Fon +49 771 83160 | Fax +49 771 831650 | info@bb-sensors.com | bb-sensors.com

CE   8 / 12

7. Calibration Services

Calibration certificates can be issued by the factory. For this the device has to be sent to the manufacturer. Just the manufacturer can check the factory settings and correct them if necessary.

8. Specification

Measuring Probe	
Thermocouple	Thermocouple Typ J, K, N, S or T
Probe Connection	Socket for flat pin plug, free from thermo voltage for type K
Resolution	0,1°C or 1°C, 0,1°F or 1°F for types J, K, N, T 1°C or. 1°F for type S

Measuring Range	0,1°C	1°C	0.1F	1°F
Type K: (NiCr-Ni)	-65,0... +300,0°C	-220... +1372°C	-85,0... +572,0°F	-364... +2500°F
Type J: (Fe-CuNi)	-50,0... +225,0°C	-140... +950°C	-58,0... +437,0°F	-220... +1742°F
Type T: (Cu-CuNi)	-65,0... +250,0°C	-220... +400°C	-85,0... +482,0°F	-364... +752°F
Type N: (NiCrSi-NiSi)	-100,0... +380,0°C	-200... +1300°C	-148,0... +716,0°F	-328... +2372°F
Type S: (Pt10Rh-Pt)	_	-50... +1768°C	_	-58... +3214°F

Precision (for thermocouples DIN EN 60584) ±1Digit (at nominal temperature)		
	Range 0,1°C/F	**Range 1°C/F**	
Type K	±0,03% of m. v. ±0,05%FS	±0,08% of m. v. ±0,1%FS	
Type J	±0,03% of m. v. ±0,08%FS	±0,08% of m. v. ±0,1%FS	
Type T	±0,03% of m. v. ±0,1%FS	±1°C (T>-100°C)	±1°C ±1Digit (T<-100°C)
Type N	±0,03% of m. v. ±0,05%FS	±0,08% of m. v. ±0,1%FS (T>-100°C)	±1°C ±0,1%FS (T<-100°C)
Type S	_	±0,1% of m. v. ±0,1%FS (T>200°C)	±1°C ±0.1%FS (T<200°C)

General data for temperature measuring	
Temperaturedrift	0,01%/K
Point of Comparison	±0,3°C
Nominal Temperature	25°C
Ambient Conditions	Temperature: -25 to +50°C rel. humidity: 0 to 95%r.F. (not condensing)
Storage Temperature	-25 to +70°C

Housing	
Dimensions	142 x 71 x 26 mm (L x B x D)
Material	impact-resistant ABS plastic housing, membrane keyboard, transparent panel

Technical changes reserved

B+B Thermo-Technik GmbH | Heinrich-Hertz-Straße 4 | D-78166 Donaueschingen
Fon +49 771 83160 | Fax +49 771 831650 | info@bb-sensors.com | bb-sensors.com

9 / 12

Assembly	Front side IP65,integrated pop-up clip for table top or suspended use
Wight	approx. 155 g

Output:
    Selectable as serial interface:
 	
    or analogue output:
	3.5 mm audio plug, stereo
	via optically isolated interface adapter (p.r.t. accessories) directly connectable to RS232-interfaces.
	0..1V, freely scaleable (12bit)

Power Supply	9V-Battery, type IEC 6F22 (included) as well as additional d.c. connector (diameter of internal pin 1.9 mm) for external 10.5-12V direct voltage supply. (suitable power supply: 0555 0211-01)
Power Consumption	approx. 260µA when output switched off approx. 400µA when output is serial interface (at 1 reading per second) approx. 500µA when output is analogue output (without load)
Display	2 four digits LCDs (12.4mm high and 7 mm high) for temperature, min./ max values, hold function, etc. as well as additional pointing arrows.
Pushbuttons	6 membrane keys altogether for on/off switch, menu operation, min. and max. value memory, hold-function etc.
Min-/Max-Value Memory	Both the max. and the min. value will be memorised.
Hold Function	Press button to store current value.
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.
EMV	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%

9.   SCOPE OF DELIVERY

Articlename	Articlenummer	Description
Precision-Second-Thermometer HM 210	**0560 0210**	1 x Precision-Second-Thermometer HM 210,with operating instruction on CD-R
Precision-Second-Thermometer HM 210 Set	**0560 0210-01**	Set Precision-Second-Thermometer HM 210,incl. 1 x Type K Probe, nominal length 130 mm and 3 mm diameter in a transportation case

Precision-Second-Thermometer HM 210

Precision-Second-Thermometer HM 210 SET

B+B Thermo-Technik GmbH | Heinrich-Hertz-Straße 4 | D-78166 Donaueschingen
Fon +49 771 83160 | Fax +49 771 831650 | info@bb-sensors.com | bb-sensors.com

INSTRUCTION MANUAL

10. Optional Order Information

Articlename	Articlenummer	Description
Immersion Probe, type K for extreme use	**0600 1205**	Diameter 6 mm, Stainless steel B+B exklusive handhold, cabel length 1000 mm with helix cable, Miniatureplug yellow, Measuringtip swagged diameter=3,0x15 mm, Measuring range -50...+850°C
Penetration Probe, type K	**0600 1105**	Diameter 4 mm Stainless steel, handhold 15x90 mm PTFE, cabel length 1000 mm, FEP 0,22 qmm, Miniatureplug yellow, Measuring range -50...+260°C
Power supply	**0555 0211-01**	Input: 100 - 240 V AC, 50/60 Hz Output: 12 V DC, 180 mA

General Questions

If you still have questions concerning this product of B+B Thermo-Technik GmbH, please do not hesitate to contact us at:

B+B Thermo-Technik GmbH
Heinrich-Hertz-Straße 4
D-78166 Donaueschingen
Germany

Tel.: +49 (0) 771 83160
Fax: +49 (0) 771 831650

E-Mail: info@bb-sensors.com
www.bb-sensors.com

We wish you a successful measuring!

Your Temperature-Partner
B+B Thermo-Technik GmbH

All technical information in this document are proved by us with high accuracy and shall inform you about all application possibilities. This information's are not confirmed by us and need to be proved by every user in regard to his intended use of the equipment. All foreign trade mark rights need to be considered.

Technical changes reserved

B+B Thermo-Technik GmbH | Heinrich-Hertz-Straße 4 | D-78166 Donaueschingen
Fon +49 771 83160 | Fax +49 771 831650 | info@bb-sensors.com | bb-sensors.com

11 / 12

INSTRUCTION MANUAL

Technical changes reserved

B+B Thermo-Technik GmbH | Heinrich-Hertz-Straße 4 | D-78166 Donaueschingen
Fon +49 771 83160 | Fax +49 771 831650 | info@bb-sensors.com | bb-sensors.com

12 / 12