//AHLBORN

Operating instructions
English

Temperature measuring instrument
THERM 2420

V1.3
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www.ahlborn.com

1. OPERATING CONTROLS

(1) Measuring input M
 M for temperature sensors with miniature thermal connector

(2) LCD
Function field
(a) Function
(b) Function value
Main field
(c) Units
(d) Measured value
(e) **Operational status**
  LOBAT Battery voltage <3.8 V
  REL Relative measuring

(3) Operating keys

 ON OFF Switch the device on
 To switch device OFF, press and hold down
  M▲ , **M▼** Meas. point selection
  MAX , **MIN** Max. / min. value
    clear: press and hold down
  MEM Measured value memory
  CLR Relative measuring,
    Adjust sensor,
    cancel: press and hold down

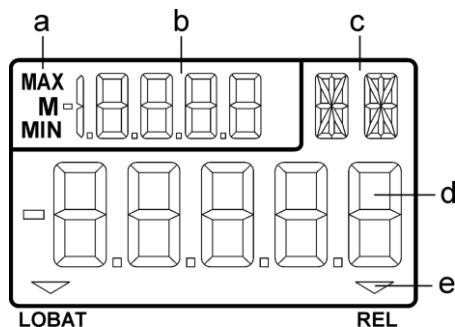**To switch ON with press keys :**
 CLR Reinitialization
 MEM Device configuration
 M▲ Softwareversion

Rear of device

(4) Battery compartment
 3 AA alkaline-manganese batteries

2. CONTENTS

2. Contents

3. GENERAL

Congratulations on your purchase of this AHLBORN temperature measuring instrument for thermocouple sensors with a miniature thermal connector. You are strongly advised to properly familiarize yourself with the device's numerous possibilities and take the time to carefully read these operating instructions. This is absolutely necessary to avoid operating and measuring errors and to prevent damage to the device. To help you find the answers to your questions quickly and easily there is a comprehensive index at the end these instructions.

3.1 Warranty

Each and every device, before leaving our factory, undergoes numerous quality tests. We provide a guarantee, lasting two years from delivery date, that your device will function trouble-free. Before you send your device to us, please observe the advisory notes in Chapter 11 Trouble-shooting. In the unlikely event that the device proves defective and you need to return it please wherever possible use the original packaging material for dispatch and enclose a clear and informative description of the fault and of the conditions in which it occurs.

This guarantee will not apply in the following cases :

● The customer attempts any form of unauthorized tampering or alteration inside the device.
● The device is used in environments and conditions for which it is not suited.
● The device is used with an unsuitable power supply.
● The device is used for any purpose other than that for which it is intended.
● The device is damaged by electrostatic discharge or lightning.
● The user fails to observe and comply with the operating instructions.

The manufacturer reserves the right to change the product's characteristics in the light of technical progress or to benefit from the introduction of new components.

3.2 Scope of delivery

When you unpack the device check carefully for any signs of transport damage and ensure that delivery is complete.

> Measuring instrument THERM 2420 with 3 AA alkaline batteries
> These operating instructions

In the event of transport damage please retain the packaging material and inform your supplier immediately.

3.3 Handling batteries / rechargeable batteries correctly

When inserting batteries / rechargeable batteries ensure that these are correctly polarized. If the device will probably not be needed for a relatively long period of time or if the batteries are empty remove the batteries; this will prevent battery acid spilling

on and damaging the device. Rechargeable batteries should be recharged as and when necessary. You should never attempt to recharge an ordinary (non-rechargeable) battery; it may explode ! Batteries / rechargeable batteries must never be short-circuited or thrown on the fire. Batteries / rechargeable batteries are special waste and must not be discarded together with normal domestic waste.

3.4 Special notes on use

- If the device is brought into the work-room from a cold environment there is a risk that condensation might form on the electronics. In measuring operations involving thermocouples pronounced changes in temperature may cause substantial measuring errors. You are advised therefore to wait until the device has adjusted to the ambient temperature before starting to use it.
- Do not run sensor lines in the vicinity of high-voltage power cables.
- Before you touch any sensor lines, ensure that all static electricity has been discharged.

4. INTRODUCTION

The THERM 2420 measuring instrument has just one measuring input with a miniature thermal socket suitable for connecting most thermocouple sensors. For operation purposes the device incorporates a large LCD display and a keypad.

Functions

Measuring ranges
7 thermocouple types, units can be selected °C or °F or mV.

Measured value
Measured data acquisition at 2.5 mops, automatic cold junction compensation, autozero, and sensor breakage detection

Relative measuring
The measured value can at any time be set to zero in order to display the difference with respect to a reference value.

Maximum and minimum values
For each measuring operation the maximum value and minimum value are acquired and saved to memory. These values can be displayed and, as and when necessary, deleted.

Measured value memory
A measured value in the display can be saved by simply pressing a key.

5. INITIAL COMMISSIONING

1.Connect   sensor to socket **M** (1) see 7.

2. **Ensure power supply** is connected with 3 AA batteries see 6.1

3. To **switch ON** press key `ON` (3) see 6.2

4. **Save the measured value** by pressing key `MEM` (3) see 9.4

5. **Relative measuring** to a reference value by pressing key `CLR` (3).
   Revert to normal measured value **by pressing and holding down** key `CLR`

6. **Evaluating a measuring operation**
   Call up maximum / minimum values by pressing keys `MAX` / `MIN` (3).
   To delete maximum / minimum value(s) press and hold down
   keys `MAX` or `MIN` see 9.3

7. To **switch OFF** press and hold down key `ON` (3) see 6.2

6. POWER SUPPLY

6.1 Battery operation and supply voltage monitoring

The power supply for this device is normally provided by 3 AA alkaline batteries. At a current consumption of approx. 10 mA the operating time will be approx. 250 hours. The current operating voltage is displayed each time the the device is switched on; this gives you a basis for estimating the remaining operating time. When the remaining battery capacity drops to approx. 10 percent, the **LO-BAT** arrow will appear in the display. If the batteries are completely discharged the device will switch off. To replace old batteries first unscrew the battery compartment cover (4) on the rear of the device.

6.2 Switching ON / OFF,

To switch the **device ON** briefly press and release the key `ON OFF` (3) in the middle of the keypad; to switch the **device OFF** press and hold down the key `ON OFF`.

If interference (e.g. electrostatic) or a malfunction (e.g. battery failure) causes the device to behave abnormally, the device can be reinitialized. To activate **RE-SET** press and hold down the key `CLR` when switching on. This will restore all settings to the factory default status. The calibration data is stored in the EEPROM on the instrument itself, on a fail-safe basis.

7. CONNECTING THE TRANSDUCERS

Input socket M on the measuring instrument (1) can be used to connect 7 different thermocouple sensors with a miniature thermal connector. The various possible types and their measuring ranges are listed in Section 10.1. To connect your own existing sensors you simply need the appropriate miniature thermal connector, ensure that these are correctly polarized.

8. DISPLAY AND KEYPAD

8.1 Display

The display (5) on the THERM 2420 measuring instrument is a 2-row LCD arrangement; the main field comprises 5x 7-segment digits (d) plus 2x 16-segment digits (c) for depicting the measured value; the function field comprises 41/2x 7-segment digits (b) for depicting various measuring functions (a); there are also 2 arrows (e) for depicting the operating status.

Function field

Main field
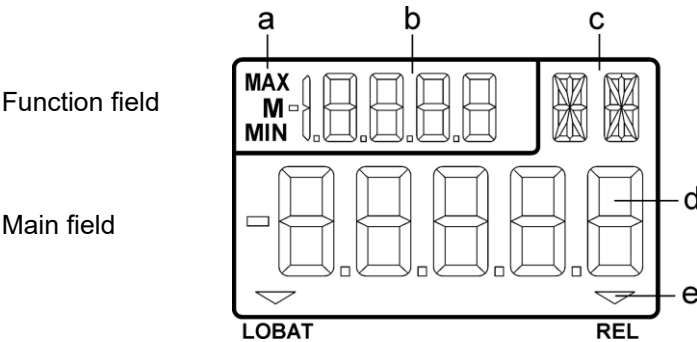
Display of measuring functions in the **function field**

Measured value with measuring range abbreviation : | **NiCr** |

Maximum value | **MAX** **36.5** |

| **MIN** **17.3** |

Minimum value

Saved value | **M** **36.2** |

Configuration of measuring range | **type** |

Configuration of automatic OFF | **AOFF** |

Configuration of function locking | **Loc** |

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Special operating states and faults

Display segment test :   runs automatically after switch ON
Supply voltage   Display after segment test
                              Under 3.8 V :   **LOBAT** arrow lights up
Relative measuring with respect to a reference value :   **REL** arrow lights up

Checksum error in
device calibration :

CALEr

Sensor   breakage   :

NiCr	flashes

Outside of measuring range,   undershoots
cold junction compensation or cold junc

CJ	flashes

tion compensation breakage :

Function is locked :

Loc	This appears

briefly

Overshoots measuring range :   Maximum value flashes
Undershoots measuring range :   Minimum value flashes

8.2 Keypad
To operate the device a keypad with 7 keys is provided :
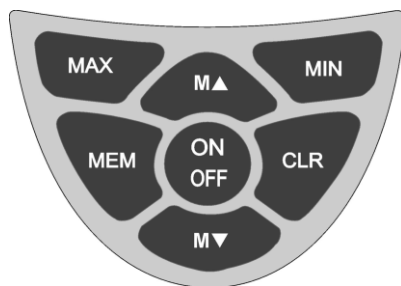
Function :   **Key**
To switch ON the device : (see Section 6.2)   ON OFF
To switch OFF the device :   ON OFF must be pressed
and held down
Selecting the units : (see Section 9.2)   M▲ or M▼
Displaying the maximum value : (see Section 9.3)   MAX
To delete press and hold down
Displaying the minimum value : (see Section 9.3)   MIN
To delete press and hold down
Zero-setting the measured value : (see Section 9.5)   CLR
To delete press and hold down
Saving the measured value : (see Section 9.4)   MEM
Displaying the battery voltage :   ON OFF

9. MEASURING OPERATIONS

To perform a measuring operation connect the sensor at socket M (see Chapter 7). The measured value is acquired continuously at 2.5 mops.

9.1 Measured value

After switching ON first of all a segment test is performed; then the battery voltage appears and if the batteries are almost empty (< 3.8 V) the **LOBAT** arrow also appears.
(see Section 6.1)
The battery voltage display can be repeated at any time by pressing key **ON** .

In the main field you will then see the temperature value with its units; in the function field you will see the abbreviation for the thermocouple (see Section 10.1). All special operating states possible for the measured value are explained in Section 8.1.
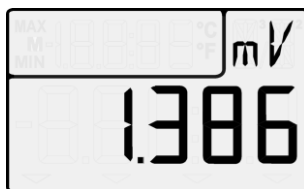
9.2 Measured value functions

By pressing key **MA** units °C and °F can be selected one after the other and as a check also the voltage in mV or the internal cold junction temperature, if these functions have been enabled (see Section 10.3). The current measured value is displayed in the main field together with the appropriate units. By pressing key **MV** you can jump back to the previous function.
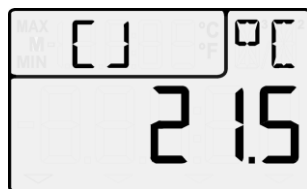
To select the measured value function press keys : **MA** , **MV**
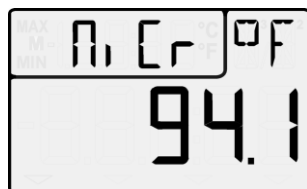
Units in °F	Voltage in mV	Cold junction temperature

By default changing the measured value functions is locked in the device configuration (display ´**LOC**´) and must first be unlocked(see Section 10.3).

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9.3 Peak value memory

From the measured values acquired the highest and the lowest values are continuously recorded. To display these peak values press key **MAX** or **MIN** . As a check the display also includes the associated symbol.

To display maximum value press key :   **MAX**
To display minimum value press key :   **MIN**
To delete maximum value press and hold down key :   **MAX**
To delete minimum value press and hold down key :   **MIN**
To jump back to the operating range display press key : **M▲**

As soon as you clear the memory, the current measured value will appear (because measuring is continuous).

9.4 Measured value memory

On the THERM 2420 any measured value can be saved. To save the measured value press key **MEM** The currently saved value then appears in the function field preceded by the symbol ´**M**´. To jump back to the operating range display press key :   **M▲**
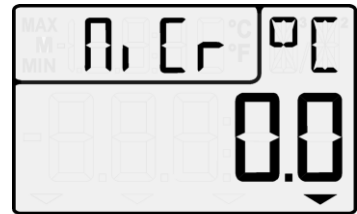
9.5 Relative measuring

One very useful function is to zero the measured value at certain locations or at certain times as a reference value in order then to observe only the subsequent deviations.

By default this function is also locked in the device configuration (display ´**LOC**´) (see 10).

To zero-set the measured value press key :   **CLR**
To display relative measuring press arrow :   **REL**
To return to normal measured value :   press and hold down **CLR**

Setting to zero automatically deletes the maximum and minimum values for this channel. The **MAX**, **MIN**, and **MEM** functions are thus also available for relative measuring.

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10. DEVICE CONFIGURATION

On the THERM 2420 measuring instrument a number of parameters can be configured. To do so when switching ON press and hold down key **MEM** . The function field should then show an abbreviation for the parameter and the main field should show the value currently set.
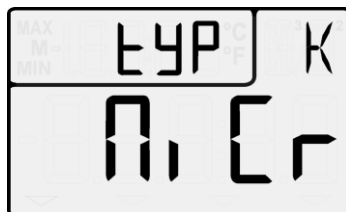
To select from all possible parameters press keys : **M▲** or **M▼**

Measuring range	**tYpe**
Automatic switch OFF time in minutes: see 10.2	**AOFF**
Function locking : see 10.3	**Loc**

To enter a value first press : **ON** the value starts flashing.
  To modify the value press keys : **M▲** or **M▼**
  Entry is completed by again pressing key : **ON**
To terminate configuration at any time press key : **MEM**

10.1 Measuring ranges

The following measuring ranges can be set via menu item ´**type**´.

Transducer	Type	Measuring range	Units	Abbreviation
NiCr-Ni	K	-200.0...+1370.0	°C	NiCr
NiCroSil-NiSil	N	-200.0...+1300.0	°C	NiSil
Fe-CuNi	L	-200.0... +900.0	°C	FECO
Fe-CuNi	J	-200.0... +950.0	°C	IrCo
Cu-CuNi	U	-200.0... +600.0	°C	CUCO
Cu-CuNi	T	-200.0... +400.0	°C	CoCo
PtRh10-Pt	S	0.0...+1760.0	°C	Pt10

10.2 Automatic switch OFF

In menu item ´**AOFF**´ an automatic device switch OFF time can be programmed in minutes; this will help save the batteries. This automatic device switch OFF will not take effect if the setting is ´- -´.

10.3 Function locking

Since there is a risk that the measuring functions or relative measuring operations may lead to misinterpretation, these are normally locked at level 3. These can, however, be individually enabled via menu item ´**Loc**´ :

Loc parameter	Locked functions
0	None
1	Measuring functions (the previously selected function is retained)
2	Relative measuring
3	Measuring functions and relative measuring (default)

11. TROUBLE-SHOOTING

The THERM 2420 measuring instrument can be configured. If in certain circumstances the device does not respond exactly as it should, the cause of such unexpected behavior is only very rarely a device defect; more usually it is incorrect operation by the user, an invalid setting, or unsuitable cabling. In such event try to pinpoint and clear the problem with the aid of the following tests.

Error: No display, display malfunction, keys do not react
Remedy: Check the power supply, charge the battery, switch off and then on again. If necessary, re-initialize; (see 6.2).
Error: Measuring functions or relative measuring cannot be started.
Remedy: Check device configuration; see 10, 10.3
Error: Measured values are incorrect.
Remedy: Switch Device OFF / ON, press key and hold **CLR**. Check measuring range configuration; see 10
Error: Fluctuating measured values or the system hangs in mid-operation.
Remedy: Check connecting cable(s), connect hand-held sensors in air or phantoms (for thermocouples short-circuit) and check.
Then reconnect the sensor and check; if necessary, insulate the sensor and eliminate interference by using shielded or twisted wiring.
Error: ´CALEr´ is displayed when the device is switched on.
Remedy: The calibration of a measuring range may have become misadjusted. The device must be recalibrated at the factory.

If, after performing the above-listed checks and remedial steps, the device still fails to behave as described in the operating instructions, it must be returned to our factory in Holzkirchen, accompanied by an explanatory note and error description.

12. ELECTROMAGNETIC COMPATIBILITY (EMC)

The THERM 2420 measuring instrument complies in full with the safety requirements specified in the EU directive relating to electromagnetic compatibility (EMC) (89/336/EWG).

The following standards have been applied in evaluating the product.

IEC 61326:1997+A1:1998+A2:2000
IEC 61000-6-1:1997   IEC 61000-4-2: 1995+A1:1998+A2:2000 8kV
IEC 61000-6-3:1996   IEC 61000-4-4: 1995+A1:2000 2kV
                                   IEC 61000-4-3: 1995+A1:1998+A2:2000 3V/m

The following advisory notes must be observed when operating the device.

1. If the standard sensor is extended (1.5 meters) care must be taken to ensure that the measuring lines are not laid together with high-voltage power cables and that, if necessary, they are properly shielded so as to prevent spurious interference being induced in the system.
2. Using the device in strong electromagnetic fields may aggravate measuring errors (<50 μV at 3 V/m and 1.5 meters thermocouple sensor). After exposure to such irradiation ceases, the device will again operate within its technical specifications.

13. APPENDIX

13.1 Technical data   (see Manual 2.3)

Measuring input **:**	1 miniature thermal socket for thermocouples with miniature thermal flat connector
A/D converter :	Delta-sigma 15-bit, at measuring rate 2.5 mops
Gain :	40, 80
Common mode input range :	-0.26 ... +2.6 V, Overload max. -4..+5V
Input current :	< 2 nA
System accuracy :	± 0.1 % v. Measuring values ± 3 Digit
Temperature drift :	0.01 %/°C
Cold junction compensation:	-30 ... +100 °C, Accuracy : ± 0.2 K ± 0.01K/°C
Self-calibration:	Automatic zero point correction
Control functions:	automatic sensor failure detection

Measuring ranges

NiCr-Ni	Type K	-200.0...+1370.0	°C
NiCroSil-NiSil	Type N	-200.0...+1300.0	°C
Fe-CuNi	Type L	-200.0... +900.0	°C
Fe-CuNi	Type J	-200.0... +950.0	°C
Cu-CuNi	Type U	-200.0... +600.0	°C
Cu-CuNi	Type T	-200.0... +400.0	°C
PtRh10-Pt	Type S	0.0...+1760.0	°C
Millivolt		-10.000...+55.000	mV

Standard equipment

LCD :	Measured value : 5x 7-segment 15 mm, 2x 16-segment 9 mm
	Function 4½ x 7-segment 9 mm, 5 symbols
Operation :	7 silicone keys
Memory :	1 measuring value on the RAM
Microprocessor :	M16C28

Power supply :

Batteries :	3 AA alkaline batteries
Current consumption :	approx. 10 mA
Battery operating time :	approx. 250 hours
Housing **:**	(LxWxH) 127 x 83 x 42 mm ABS (acrylonitrile butadiene styrene), weight : approx. 260 g

Suitable conditions

Operating temperature	-10 to +50 °C
(storage temperature	-20 to +60 °C)
Ambient relative humidity :	10 to 90 % rH (non-condensing)

13.2 Product overview

Temperature measuring instrument THERM 2420	Order no.
1 measuring input , 2-row LCD, 7 keys, 3 AA batteries	MT 24201L

13.3 Index

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