

# Manual for the Mindfield® Skin Temperature Sensor, Software Version 1.32

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## Basic Information on Skin Temperature Biofeedback

The temperature at the surface of the skin changes accordingly to the circulation of blood through body tissue. The arterioles which cross through the tissue are surrounded by fibers of smooth muscles and are controlled by the sympathetic nervous system.

During a state of increased exertion, excitement and stress, the muscles are forced to contract, causing a stenosis of vasculature. This leads to a reduction of skin temperature, since the blood circulation of the tissue is reduced. In contrast, during a state of relaxation, the musculature is also bound to relax, causing the vasculature to expand and the skin temperature rises.

The skin temperature also depends upon the temperature of the environment why it is necessary to measure in consistent surroundings. The user should take approx. 5 Minutes to get used to the environment (acclimation), in order for the organism to adapt to the room temperature.

The feedback of skin temperature measurement is mostly used for relaxation exercises. It is easy to learn, easy to operate and has a high rate of success and constant well-being for the user.

An especially effective and commonly used method is the "training of hand warming" as the most simple form of biofeedback. Here the sensor is fixated either to the index-finger or the middle-finger. The training enables the user to increase the skin temperature in his fingers, by giving a feedback of it, thus increasing the blood circulation of the hands.

The hand warming-training is successfully used for specific dysfunctions like megrim, hypertension and disturbed blood flow.

**Your biofeedback therapist will gladly provide you with further information regarding concrete execution of skin temperature biofeedback training!**

## **System Requirements**

- System Software:  
Windows XP Home or Professional incl. Service Pack 3  
Windows VISTA (32bit and 64bit)  
Windows 7 (32bit and 64bit)
- Min. Pentium IV or comparable, 2 GHz.
- Min. 1024 MB RAM.
- Graphic board with min. of 256MB dedicated video-memory.
- Free disk space: 500 MB.
- Screen resolution of min. 1280\*800 Pixel, screen colors 32 Bit True Color.
- Second monitor for display of feedback is optionally recommended.
- Min. Sound Blaster compatible sound card with Stereo output.
- USB 2.0 connection or better.

## First Steps

1. Connect the Mindfield Skin Temperature Sensor with the provided USB-cable.
2. Connect the Sensor to a free USB-slot of your PC.
3. The sensor is registered by Windows and ready to operate in no time. One of the LED-lights glows permanently, the other one just blinks.
4. Now you can insert the provided USB-stick to a free USB-slot of your PC.
5. Open the Explorer and navigate to the USB-stick (BioEra), open it with double-clicking on it.
6. First you find a file named **vcredist\_x86.exe**, please execute this file to install important C++ runtime files from Microsoft. These are needed to run the skin temperature sensor software.
7. You will see a folder labeled „Mindfield Hauttemperatursensor Version 1.31“. Please double-click on that folder.
8. You will find a file labeled „**start\_runtime.bat**“ which you can execute with a double-click.

9. This is the main menu of the software for the Mindfield Skin Temperature Sensor:



10. Please enter your name at „Neuer Proband“. Please do not use any special characters, only usual digits, A-Z and a-z. Click on „OK“ to save the user profile. For later sessions you can chose your name from the list below.
11. Attach the sensor to the desired location. The next section shows you how to do this.
12. In the end click on „Zum Training“.

## Application and Attachment of the Skin Temperature Sensor

The head of the sensor is a highly sensitive temperature sensor so please handle it with great care. There are several possibilities of attaching the sensor.

1. You autonomously hold the sensor, e.g. between your thumb and the index-finger (Figure 1)
2. You apply the provided tape and wrap it around the index-or middle-finger several times together with the sensor. (Figure 2, Figure 3)
3. You attach the provided hook-ring to a finger and slide the sensor in-between
4. You apply the sensor to other parts of the hand, e. g. the palm with the tape

Always attach the sensor to the same spot, in order to maintain comparabilities from session to session.

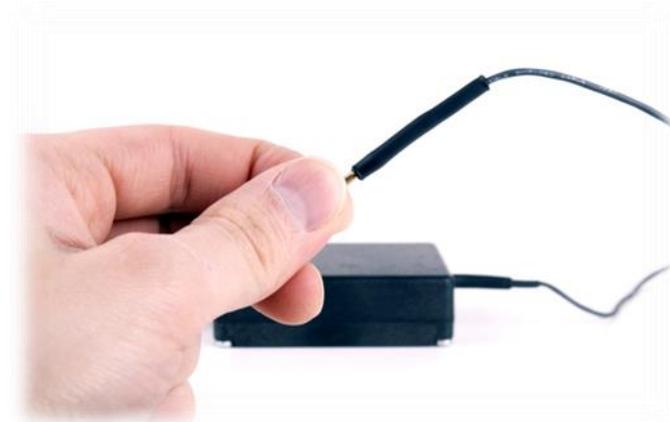


Figure 1



Figure 2

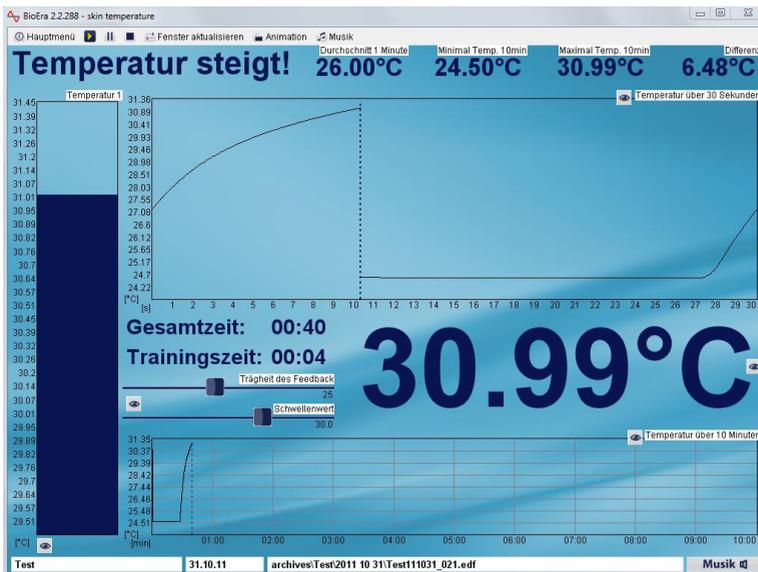


Figure 3

# The Training-screen

The training-screen consists of two windows, one being the control window, the other being the training window. If you are able to work with two separate screens, we recommend moving the training window to the second monitor. You can alter between the two windows by clicking on the Windows menu bar.

## Overview over the control window:



On the upper border of the window you find the menu bar:



The button **Hauptmenü** brings you back into the main menu. You can start a new session with another user from the main menu or switch to the analysis screen.

The buttons  **Start**,  **Pause**,  **Stop** are used to start, pause or end (includes saving) of a current session.

If any graphical errors occur, for example if you move a window, you can use the button  **Fenster aktualisieren** to trigger a repaint of the screen.

 **Animation** opens a pop-up window and let you choose from several included feedback animations (2nd screen) or from your own.

 **Musik** let you choose from several included feedback music/sounds or from you own files you may have.

In the upper part of the control window you see the following display:



left to right:

- An indication of whether the temperature is rising or falling at the current time
- The average temperature of the last minute of training, measured in degree Celsius.
- The lowest measured temperature of the last 10 minutes of your training.
- The highest measured temperature of the last 10 minutes of your training.
- The difference between the highest and the lowest measured temperature of the last 10 minutes of your training.

Below this display you can see the momentary development of the temperature from 30 seconds of training. The bar on the left side shows the current temperature in the form of a thermometer, while the right side states the temperature in degree Celsius.

Another area in the middle of the screen displays these control sliders:



The **total time (Gesamtzeit)** provides information about the length of the session, while the **training time (Trainingszeit)** tells how long the user has exceeded the desired **threshold (Schwellenwert)** value, concerning temperature. In this case the adjusted value is 30° Celsius which means that the training time starts counting, when the temperature has exceeded 30° Celsius and stops right away if the temperature falls below this value.

Another control slider permits the adjustment of **inertness of feedback (Trägheit des Feedbacks)**. A lower inertness is recommended if the temperature fluctuates a lot. When the temperature is constant, a higher inertness is recommended. If the temperature remains constant, a higher inertness prevents a regular change between feedback of increased and decreased temperature.

The lower part of the screen displays the progression of temperature within 10 minutes.

At the bottom of the screen you see information regarding the current session, the user name, the date and the name of the file.

Test 1	02.05.11	archives\Test 1\2011 05 02\Test 1110502_004.edf
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By clicking on the button  you can switch the feedback-music on and off.

Use the button  to show/hide the elements near to respective button. This helps you to adjust the amount of visual feedback give at a time.

## Overview over the Training-screen:



The Training-screen includes the display of temperature through a thermometer on the left side and a numerical value in degree Celsius on the right side.

You can see an animation which starts in the case of rising temperatures and pauses if the temperature drops. Acoustically, an increasing temperature is accompanied by a certain tune which changes or stops if the temperature decreases.

If you exceed the adjusted threshold value an indication of the total time and the training time appears.

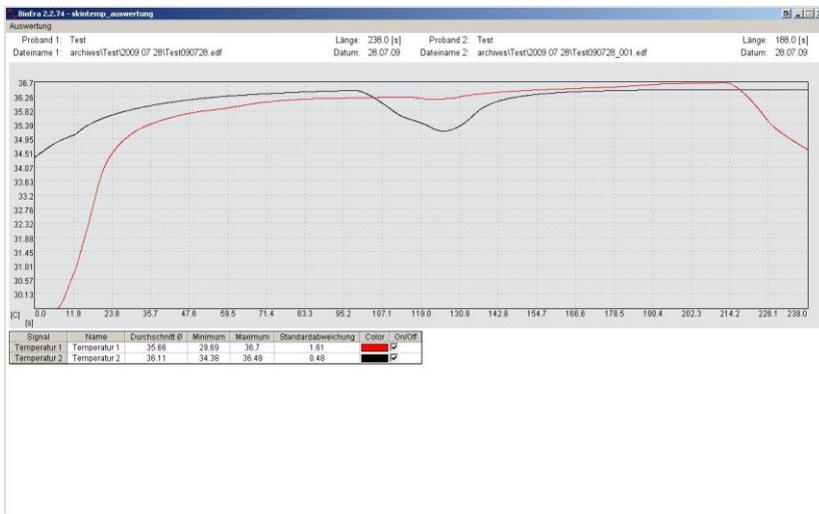
**Objective:** Try to achieve as much training time as possible regarding the total time. Increase the threshold value from session to session to elevate the level of difficulty.

Use the button  to show/hide the elements near to respective button. This helps you to adjust the amount of visual feedback give at a time.

# The Evaluation-screen

All session will be saved directly on the USB stick in the folder called “archives”. The session are saved in the “.edf” file format, which is a standard file format for physiological data. In addition to the “.edf” files, for each session a Microsoft™ Excel™ file is created for further evaluation. More details can be found in the next chapter.

In the main menu you find the button **Auswertung**. Click on it to reach the evaluation-screen.



Then click on „evaluation“ (Auswertung) and „load EDF File“ (EDF Datei laden).



After a short loading time your first recording is loaded. **The evaluation-screen offers you the opportunity to compare two recordings with each other. Therefore, you can also load a second EDF file (EDF Datei 2 laden).**

If you have executed more than one recording of the same user name and on the same day, the recordings will have different endings, 001, 002, 003, and so on.

Once you have opened a recording the progression of temperature is displayed. This can take a short period of time, depending on the length of the recording.

In the upper part of the screen you can receive information about both of the files.

Left side:

Proband 1: Test	Länge: 238.0 [s]
Dateiname 1: archives\Test\2009 07 28\Test090728.edf	Datum: 28.07.09

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**Display “Proband 1”** shows the name of the subject as entered in the main menu from first edf file (EDF - Datei 1).

**Display “Dateiname 1”** provides the path and filename of the first edf file (EDF - Datei 1).

**Display „Länge“** shows the length of the loaded session from edf file 1.

**Display „Datum“** provides the saved date of the recording of the first edf file 1.

Right side:

Proband 2: Test	Länge: 188.0 [s]
Dateiname 2: archives\Test\2009 07 28\Test090728_001.edf	Datum: 28.07.09

**Display “Proband 2”** shows the name of the subject as entered in the main menu from second edf file (EDF - Datei 2).

**Display “Dateiname 2”** provides the path and filename of the second edf file (EDF - Datei 2).

**Display „Länge“** shows the length of the loaded session from edf file 2.

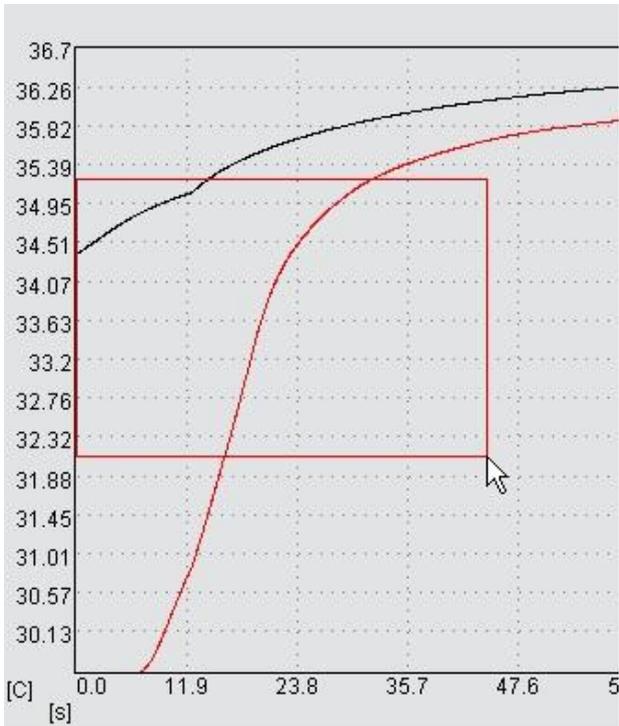
**Display „Datum“** provides the saved date of the recording of the first edf file 2.

Below the evaluation-graph is a chart:

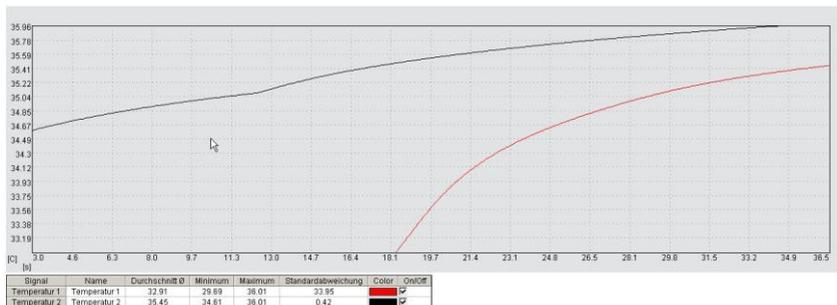
Signal	Name	Durchschnitt $\bar{x}$	Minimum	Maximum	Standardabweichung	Color	On/Off
Temperatur 1	Temperatur 1	35.66	29.69	36.7	1.61		<input checked="" type="checkbox"/>
Temperatur 2	Temperatur 2	36.11	34.38	36.48	0.48		<input checked="" type="checkbox"/>

This chart displays the average value, the minimum, the maximum and the standard deviation the temperature graphs **that are momentarily visible in the graph above! (Temperatue 1 responds to EDF file 1 and Temperature 2 to EDF file 2)**

You can alter the section of the temperature curves by clicking and then dragging with the mouse.



The graph and the chart then automatically adapt to your selection!



If you want to go back to the enlarged view, click with the right mouse button anywhere on the graph:



Chose „Show All“ to go back to the maximized view.

The upper menu provides you with the following other features:



- You can print a diagram (with a print preview) called “Drucken” and “Druckvorschau”
- You can arrange the page for proper output from your printer (Seite einrichten)
- You can save a screenshot of a graph (Screenshot speichern)

If you want to save a screenshot you have to name the file:

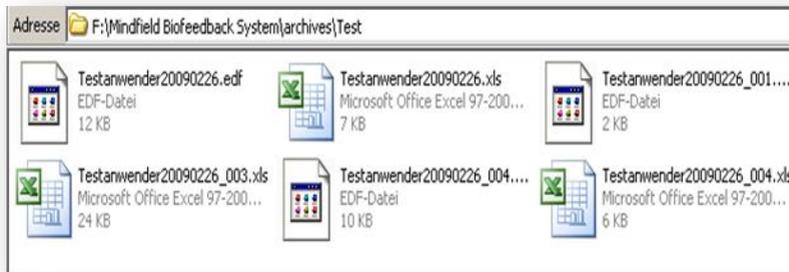


For this example we wrote „Test“ and the file is directly stored in the directory labeled „archives“ on the USB-stick. You do not have to enter a file-ending; the file will automatically end with PNG. This is a standard format for graphics which can be opened by any program running on windows. The screenshot is always made from the current display of the graph and the print-out too.

**In the event of an incorrect display of a recording, please load it again.**

## Evaluation with Microsoft™ Excel™

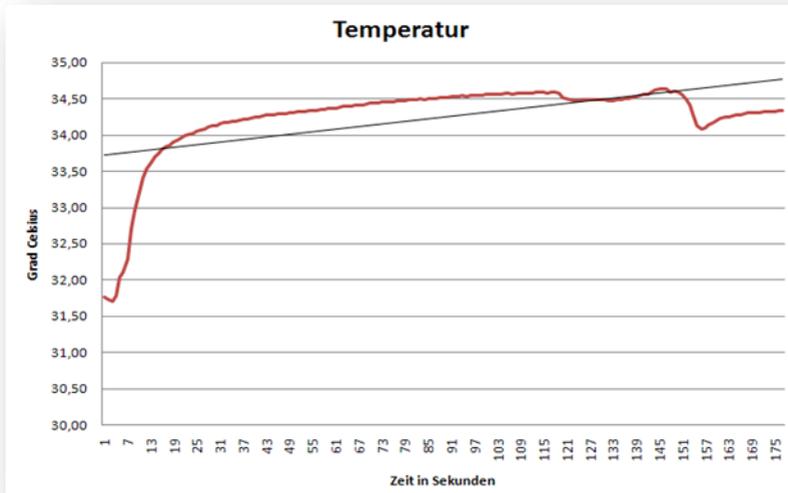
The Excel files are found on the USB-stick in the folder „archives“ of the Mindfield Skin Temperature Software. For every user there is a new folder created. The name of the file consists of the user name and the date.



An Excel file can be easily opened without any further adjustments, each row is the value of one second, and is displayed like this =>

	A	B	C
1	Temperatur	Schwellenwert	Trägheit
2	31,77	30,00	25,00
3	31,73	30,00	25,00
4	31,70	30,00	25,00
5	31,78	30,00	25,00
6	32,03	30,00	25,00
7	32,11	30,00	25,00
8	32,29	30,00	25,00
9	32,70	30,00	25,00
10	32,97	30,00	25,00
11	33,22	30,00	25,00
12	33,41	30,00	25,00
13	33,54	30,00	25,00
14	33,62	30,00	25,00
15	33,69	30,00	25,00
16	33,74	30,00	25,00
17	33,80	30,00	25,00
18	33,84	30,00	25,00
19	33,87	30,00	25,00
20	33,90	30,00	25,00

With only a few mouse clicks you can create interesting evaluations:



## Troubleshooting

- If any graphical errors occur please click on „refresh“ (Fenster aktualisieren).
- If the windows are not reachable with the mouse anymore, you can always reset them so that they are in a central position by pressing „Ctrl+R“ on your keyboard.
- If a recording is not properly displayed in the evaluation screen please simply load it again or refresh it with the context menu available via the right mouse button over the graph.

For any further errors that occur please contact us at [info@mindfield.de](mailto:info@mindfield.de) !  
Thanks for your support!

## EC Declaration of Conformity

**in accordance with the following directive(s):**

The Electromagnetic Compatibility Directive (EMC) (2004/108/EG)  
RoHS - Restriction of (the use of certain) hazardous substances  
(2011/65/EU)  
WEEE Waste Electrical and Electronic Equipment (2002/96/EG &  
2008/34/EG)

## **The manufacturer**

Mindfield Biosystems Ltd.  
Hindenburgring 4  
D-48599 Gronau  
Germany

WEEE-Reg.-Nr. DE 24465971

**hereby declares that the following product:**

„Mindfield® Biofeedbacksystem Temperature“ / „Mindfield® Skin Temperature Sensor“

**complies with all applicable essential requirements of the directives.**

**It is in conformity with the applicable requirements of the following documents:**

DIN EN 60950-1 Information technology equipment – Safety – Part 1: General requirements (2011-01)

DIN EN 55022 Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement (2008-05)

DIN EN 55024 Information technology equipment - Immunity characteristics - Limits and methods of measurement (2011-09)

**Place: Gronau**

**Date: 24th of August, 2017**



Niko Rockensüß, Managing Director

## Technical Data

- Operating voltage: 5.0 Volt using USB port
- Power consumption < 30mA
- Measuring range of temperature > 15 °C < 45 °C
- Temperature resolution appr. 0.6/1000 °C, < 0.001 °C per LSB
- Temperature accuracy +- 1 °C at 35 °C
- ESD protection according to IEC 61000-4-2 (ESD) 15kV (air 8kV (contact))
- A/D converter resolution 16bit, at 15Sps
- <= 1 LSB noise of the analog front end incl. ADC
- Anti-alias lowpass filter:  $f_c = 1.6 \text{ Hz}$  (-3dB)
- USB 2.0 class device, HID class 1.1

## Contact

If you have any questions about this biofeedback device for skin temperature measurement, please contact your biofeedback therapist.

If you have technical problems with the sensor or the software please contact the manufacturer:

Mindfield Biosystems Ltd.  
Hindenburgring 4  
D-48599 Gronau  
Germany

Support via email at: [support@mindfield.de](mailto:support@mindfield.de)

**For support via phone please call: +49 (0)2565 406 27 27**



The Mindfield MindLights have to be recycled as electrical waste according to the legal requirements.

WEEE-Reg.-Nr. DE 24465971