



Sand Moisture Meter

BTS-5000

Manual

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No guarantee is issued for the correctness of this manual. As, in spite of all efforts, errors cannot be completely avoided we always appreciate advice.

In single cases the description can differ from the delivered hard and software. Particularly the displays represented in this documentation are examples and may therefore slightly differ from the delivered product.

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1 Introduction

The sand moisture measurement system BTS-5000 consists of an operating unit BTS-5000 with touch display and of 1 to 4 sensors which determine the moisture content in sand and other aggregates. The BTS-5000 is delivered in a rack (WHD 160 x 120 x 50 mm) with front frame (WHD 170 x 130 x 4 mm).

The BTS-5000 recalls and processes the measured data of the sensors 100 times per second.

Existing signal outputs:

- Analogue outputs: 0-10 V DC and 0-20 mA or 4-20 mA (both voltage and current output are active)
- Digital outputs: RS 232, RS 485 (one of these outputs is active)

Attention!

When using microwave sensors, the setup parameter “Sensor X reversed” must be set to “0”. For conductivity sensors with the measurement converter MWU-2000, the setup parameter “Sensor X reversed” must be set to “1” (see chapter 7.8).

1.1 Guidelines

Operable temperature range: +1 to +50°C

Maximum grain size: 8 mm

In order to assure a high measuring accuracy, it is important that the sensors are installed correctly.

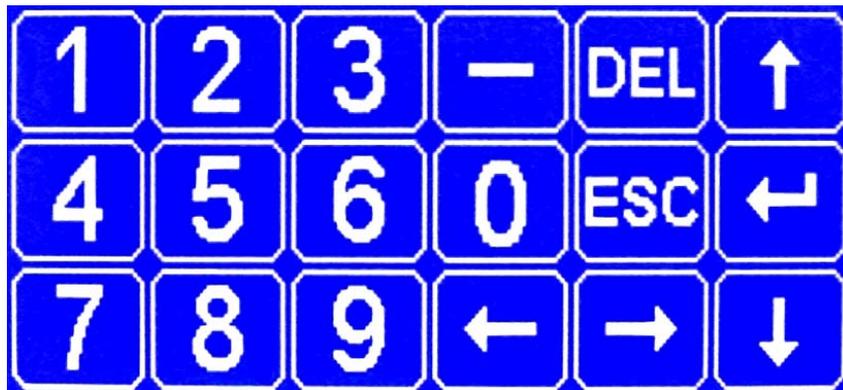
2 Elementary Operation

The BTS-5000 is switched on by inserting the power supply into a power socket.

After switching on the BTS-5000, the display shows the current measured values of the connected sand sensors (up to 4) simultaneously in percent. These values are also output on the analogue outputs and on the selected serial interface.

You operate the BTS-5000 completely through the touch display.

The BTS-5000 is mainly operated through the same buttons, which will therefore be explained only once.



Enter button: By pressing the button  you can confirm and save changes.



Escape button: By pressing the button  you will get back to the main screen. gelangt If you have made any changes/adjustments in the menus, they will not be saved.



Delete button: By pressing the button  you will delete adjustments / changes already made.

3 **Button Man.: Manual Operation**

The manual operation is used for a manual moisture output. It is started by pressing the field of the desired sensor. After choosing a sensor, it is possible to press the button Man. and to enable the manual mode.

The screen now shows the display "Manual value sensor X". You can then enter the desired value through the digit field, by pressing the enter button it will be stored.

The manually adjusted moisture value is marked "Man.".

In order to deactivate the manual operation, you have to select the corresponding sensor and press the button Man. again.

4 **Button Cal.: Calibration**

In order to calibrate a sensor proceed as follows:

1. Choose a sensor by pressing the corresponding field.



2. Press button Cal.
 The selected sensor is now marked „Cal.“ on the screen. This signals that the current value has been saved. The sensor is highlighted white for a short time.
3. Take a sand sample at the measuring area of the sensor and determine the moisture.
4. Select the sensor again by pressing the corresponding field if it is not highlighted anymore.
5. Press button Cal.
6. Enter the determined moisture value with the digit field, confirm by pressing the enter button.

You should calibrate the sensor twice, once with drier material (2-5 %), one with wetter material (6-9 %). The BTS-5000 recognizes automatically if it is a dry or wet calibration.

The BTS-5000 accesses these calibration values for the following measurements, which are also graphically displayed as a curve.

This curve can be accessed as follows:

1. Select a sensor by pressing the corresponding field.
2. Press the button Graph, the graphical display measuring curve will appear.

3. Press the button **Cal.**, now the display will show the calibration curve.

The calibration curve can be deleted any time (see chapter 6.6).

5 **Button Graph:** Graphical Display of the Moisture Course

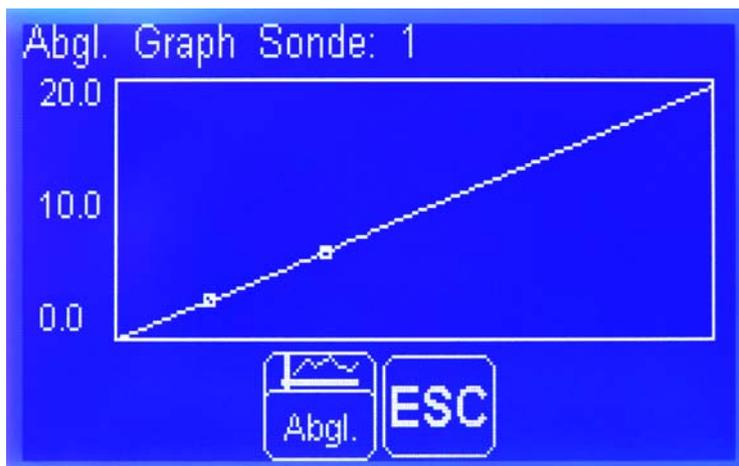
The BTS-5000 displays the moisture course graphically for every connected sensor.

The moisture curve can be accessed by selecting the desired sensor and then pressing the button **Graph**.

In the parameter menu (see chapter 3.5), you can adjust the sample rate for the graphical moisture display. The default value is 10 seconds. This means that the BTS-5000 sets a pixel every 10 seconds.



If you press the button **Cal.** at this point, the BTS-5000 will show the calibration curve for the corresponding sensor.



6 **Button Para: Parameter Settings**

The parameter menu can be opened by pressing the button **Para** on the main screen. In this menu, you can make various adjustments.

6.1 **Sensor X min.**

Here you can enter the minimum value for the connected sensors. If you enter a value of 2.0 for example, the BTS-5000 will display all moisture values higher than 2.0 % normally, for smaller values it will display and output 2.0 %.

6.2 **Sensor X max.**

Here you can enter the maximum value for the connected sensors. If you enter a value of 10.5 for example, the BTS-5000 will display all moisture values smaller than 10.5 % normally, for higher values it will display and output 10.5 %.

6.3 **Sensor X alarm min.**

Here you can enter an alarm minimum value in % for every sensor. This means that a signal will be output on the digital output, if the measured value falls below the entered value. The lowest possible value is 0 %.

This function must be additionally activated in the setup menu. In the setup menu, it is also possible to reverse the signal (see chapter 7.1.9).

6.4 **Sensor X alarm max.**

Here you can enter an alarm maximum value in % for every sensor. This means that a signal will be output on the digital output, if the measured value exceeds the entered value. The highest possible value is 30 %.

This function must be additionally activated in the setup menu. In the setup menu, it is also possible to reverse the signal (see chapter 7.1.9).

6.5 **Sample rate graph [s]**

In this menu you can enter the sample rate for the graphic moisture display. This means that you can enter the time period in seconds, after which the BTS-5000 sets a pixel in the moisture curve.

The smallest adjustable value is 0.1 sec, the highest value 240 sec. If you choose the highest possible value, the BTS-5000 can display a moisture course of 13 hours.

6.6 **Color scheme 0..17**

Here you can choose between 17 different color schemes.

6.7 **Delete calibration sensor X**

By entering a "1" with the digit field, you can delete the calibration values of the corresponding sensor.

7 **Button Setup: Setup Settings**

This menu contains basic settings and is therefore protected by a password.

After entering the password, you can select the following submenus.

- Adjustments 7.1
- Errors 7.2
- Calibrate touch 7.3
- Hardware Monitor 7.4

7.1 Adjustments

7.1.1 Language

In the menu “Adjustments”, you will find the language currently active in the first place. By pressing the corresponding line, you can choose another language through the digit field.

- | | |
|-------------|-------------|
| 0 = German | 3 = Spanish |
| 1 = English | 4 = Italian |
| 2 = French | 5 = Russian |

7.1.2 Sensor X active

Here you can activate or deactivate the selected sensor through the digit field. If you enter a “1” the sensor will be activated, with a “0” it will be deactivated. A deactivated sensor will not be shown on the display anymore.

7.1.3 Sensor X final value

Here you can enter the final value of the sensor in percent. This means that the BTS-5000 will output the maximum voltage of 10 V DC or 20 mA for this value.

The default value is 20 %. The smallest possible value is 5 %, the highest value 100 %.

Example: If you enter a final value of 5 %, the BTS-5000 will output 10 V for a moisture value of 5 % and 0 V for a moisture value of 0 %.

7.1.4 Sensor X average

In this menu, you can activate or deactivate the controlled averaging for the selected sensor. If the averaging is activated, it will be started **as soon as there is a signal on the digital input**. The averaging is active throughout the whole duration of the signal (Input E1 = sensor 1, input E2 = sensor 2, input E3 = sensor 3, input E4 = sensor 4; see chapter 8.5).

By entering a “1”, the controlled averaging will be switched on, with a “0” it will be switched off.

The average is displayed on the screen and continuously output.

7.1.5 Sensor X average time

In this menu, you can adjust the continuous averaging for the selected sensor. The continuous averaging is active during a defined time period in seconds, which can be entered through the digit field.

It is possible to define a time period of 1-30 seconds.

The average is displayed on the screen and continuously output.

7.1.6 Sensor X with trigger

Here you can activate the external input of the selected sensor. This means that the measurement will only start if there is a signal on the external input (Input E1 = sensor 1, input E2 = sensor 2, input E3 = sensor 3, input E4 = sensor 4; see chapter 8.5).

By entering a "1" the external input can be activated, with a "0" it is deactivated.

7.1.7 Sensor X alarm

Here you can activate or deactivate the alarm minimum and maximum values entered in the parameter menu. This means that a signal will be output if the measured value falls below the minimum value or exceeds the maximum value (Output A1 = sensor 1, output A2 = sensor 2, output A3 = sensor 3, output A4 = sensor 4; see chapter 8.5).

By entering a "1", the alarm will be switched on, with a "0" it will be switched off.

7.1.8 Sensor X reversed

In this menu, you can reverse the sensor signal, which is necessary for certain sensor types. This adjustment is made once when the BTS-5000 is installed and should not be changed by the customer.

Basically, the value must be set to "0" for microwave sensors and to "1" for conductivity sensors.

7.1.9 Sensor X Offset

Here you can enter an offset value for the sensor. Positive and negative values are possible.

7.1.10 Alarm reversed

In this menu, you can reverse the alarm. This means that the BTS-5000 will output a continuous signal on the digital output which will be interrupted if the measured value falls below the alarm minimum or exceeds the alarm maximum (Output A1 = sensor 1, output A2 = sensor 2, output A3 = sensor 3, output A4 = sensor 4; see chapter 8.5).

By entering a "1" the reversing can be activated, with a "0" it is deactivated.

7.1.11 0-20 mA / 4-20 mA

Here you can choose between the output 0-20 mA and 4-20 mA.

0 = 0-20 mA / 0-10 V DC

1 = 4-20 mA / 2-10 V DC

7.1.12 RS 232 / RS 485

Here you can choose between the serial interfaces RS 232 and RS 485.

- 0 = RS 232
- 1 = RS 485 (Option)

7.1.13 Ser. active

Here you can activate the serial interface.

By entering a „1“ the interface is activated, with a „0“, it is deactivated.

7.1.14 Ser. baud rate

Here you can adjust the baud rate. The default value is 9600 bits per second and should not be changed by the customer.

7.1.15 Sensor X damping

Here you can enter a damping value (0-100) for the sensor.

7.1.16 Sensor X unit

Here the measuring unit can be adjusted depending on the sensor connected.

7.1.17 Sensor 1 decimal places

Here you can select how many decimal places should be displayed (0, 1 or 2).

7.1.18 Show temperature

Here you can activate the display of the device internal temperature.

By entering a „1“ the temperature display is activated, with a „0“, it is deactivated.

7.1.19 Show voltage

Here you can activate the voltage display for every single input.

By entering a „1“ the voltage display is activated, with a „0“, it is deactivated.

7.1.20 Serial no.

Here you can see the serial number of your device.

7.1.21 Master reset

With this menu, you can carry out a master reset of the BTS-5000. This means that the complete memory will be deleted, all parameters will be set to default values.

You can carry out the master reset by entering a „1“.

7.2 Errors

Here, the BTS-5000 displays eventual error messages.

7.3 Calibrate Touch

With this menu, the touch screen can be calibrated. The display should only be calibrated by trained personnel.

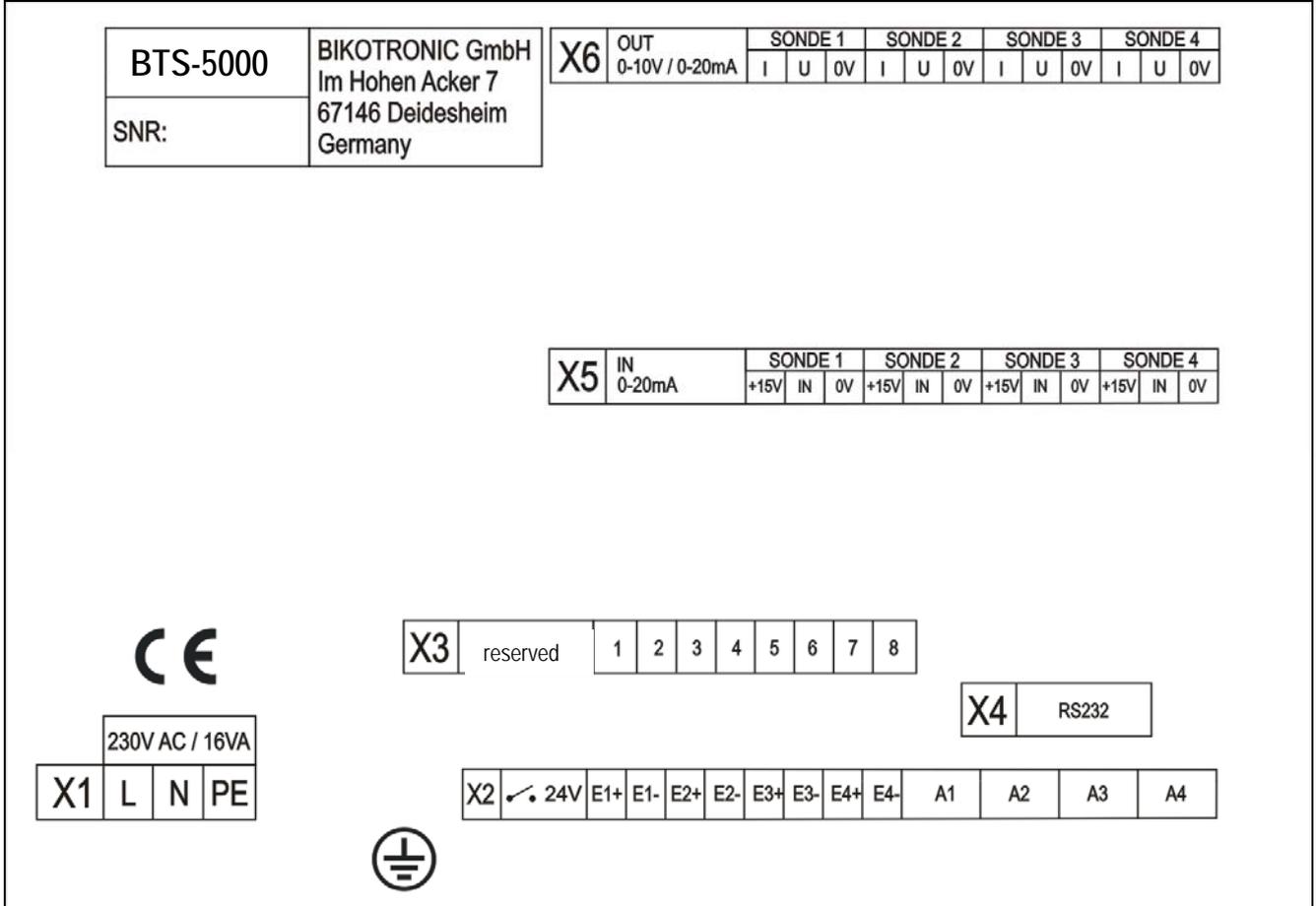
In order to leave the menu “Calibrate Touch” (for example after having it selected by mistake), the power socket has to be removed.

7.4 Hardware Monitor

Here you can see all inputs and outputs. This display is mainly used for the examination of the device by Bikotronic.

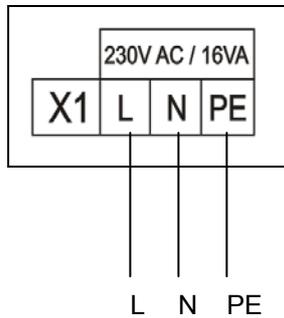
8 Connecting Diagrams

All connections are made on the back side of the BTS-5000.

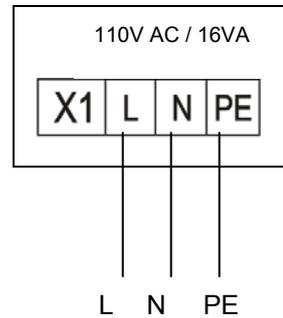


8.1 Connecting the BTS-5000 with the grid

The BTS-5000 is connected with the grid via socket X1.



Grid 230 V AC



Grid 110 V AC

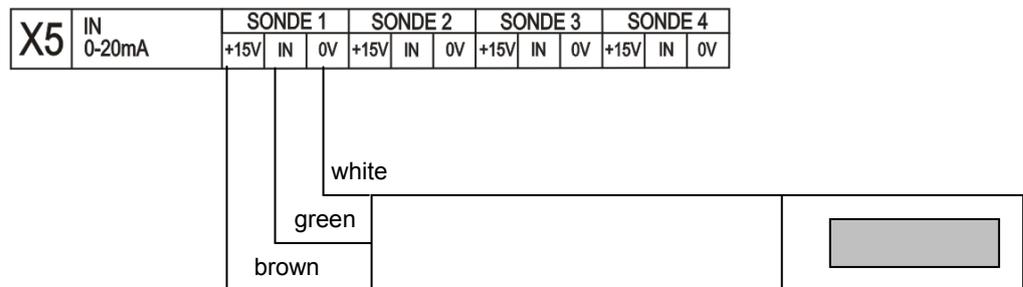
Abbreviations: L = line N = neutral PE = protection earth



Moreover, the BTS-5000 has to be additionally grounded according to VDE. This also helps complying with the EMV values.

8.2 Connecting microwave sensors with the BTS-5000

Microwave sensors are connected with the BTS-5000 via socket X5. All inputs are current inputs which are internally closed with 500 Ω. The input current must not exceed 20 mA.



Microwave pipe sensor

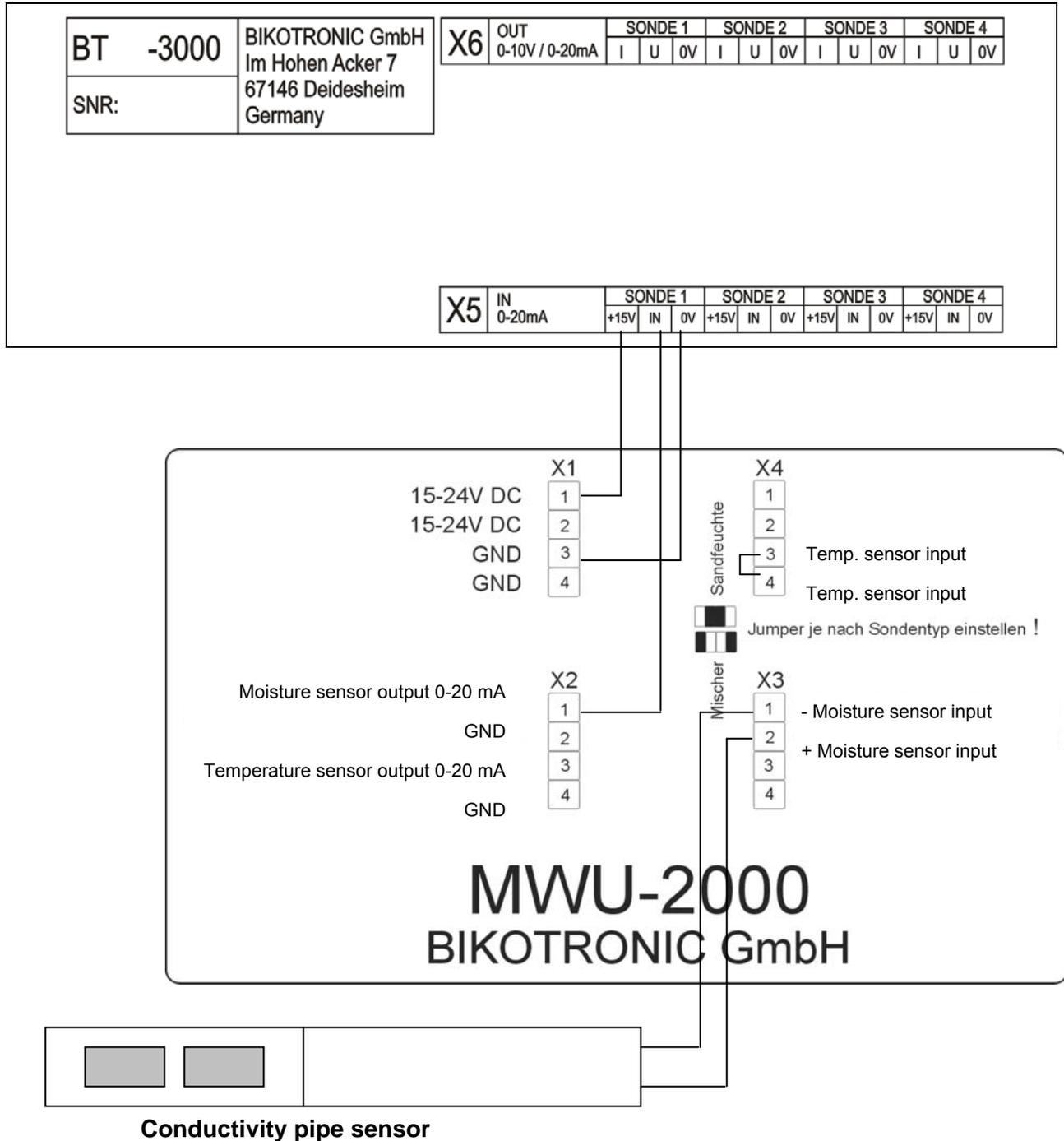
Further microwave sensor can be connected as explained above.

The maximum current carrying capacity of the +15 V feed-in is 120 mA per sensor. Thus, you can connect four microwave sensor or four MWU-2000 units with conductivity sensors directly with the BTS-5000. It is not necessary to connect an additional power supply.

If microwave sensors are connected to the BTS-5000, it is necessary that the setup parameter "Sensor X reversed" is set to "0" (see chapter 7.1.8).

8.3 Connecting conductivity sensors via MWU-2000

Conductivity sensors are connected with the BTS-5000 via a measurement converter MWU-2000 on socket X5.



It does not matter which cable is connected to the plus or minus.

Further conductivity sensors / measurement converters can be connected as explained above.

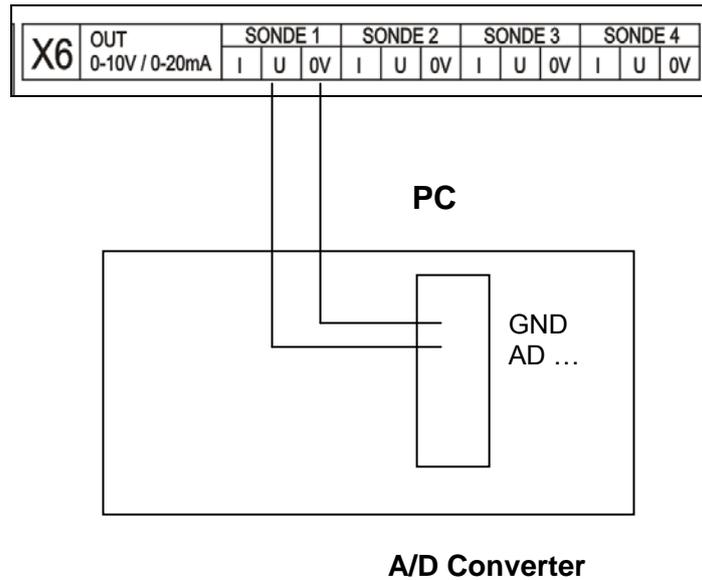
The maximum current carrying capacity of the +15 V feed-in is 120 mA per sensor. Thus, you can connect four microwave sensor or four MWU-2000 with conductivity sensors directly with the BTS-5000. It is not necessary to connect an additional power supply.

If conductivity sensors are connected to the BTS-5000, it is necessary that the setup parameter “Sensor X reversed” is set to “1” (see chapter 7.1.8).

8.4 Connecting the BTS-5000 with a PC

The BTS-5000 is connected with a PC directly via socket X3 or X4 (serial interfaces).

Alternatively, it is also possible to connect the BTS-5000 via socket X6.

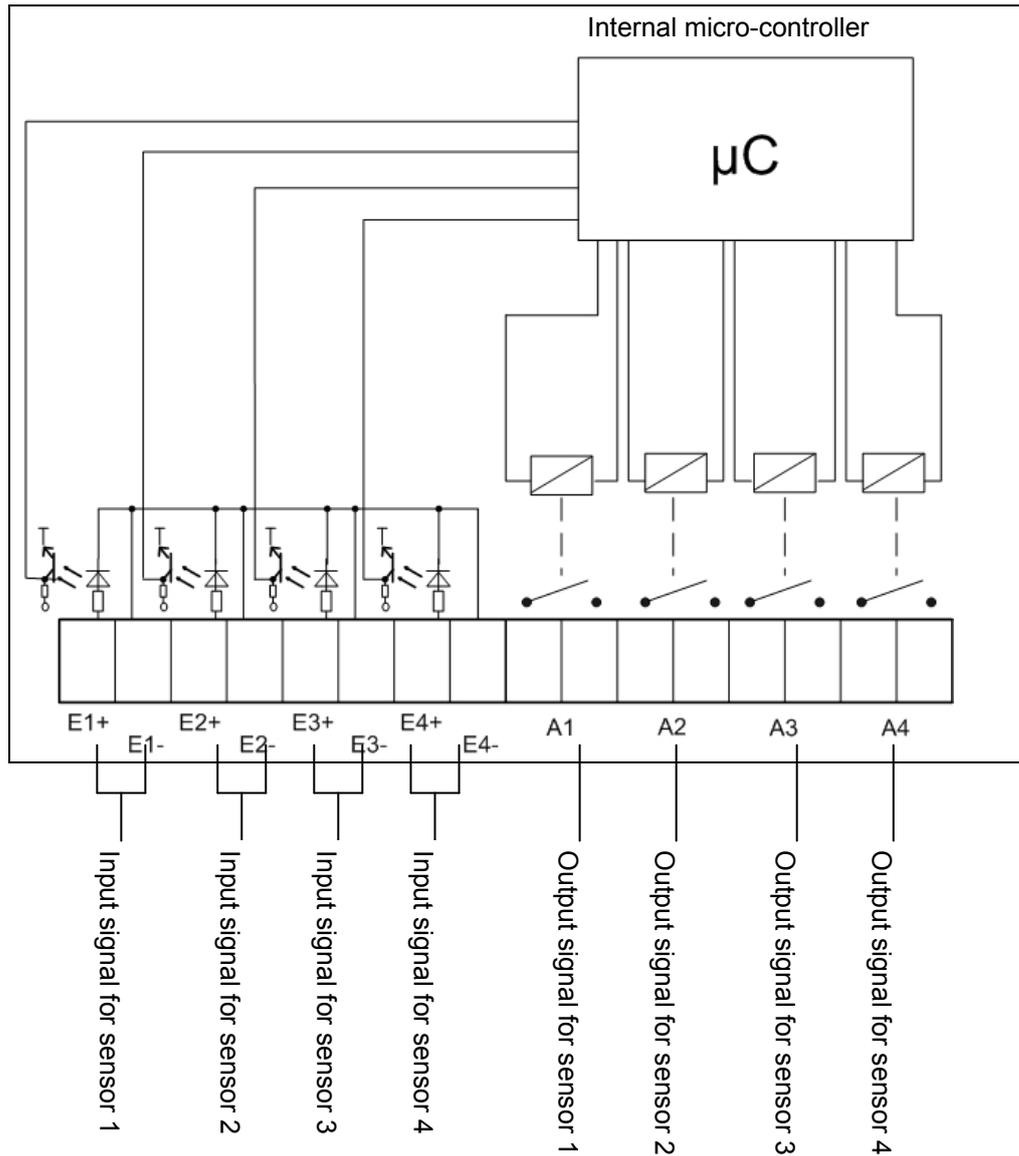


8.5 Digital inputs and outputs

The BTS-5000 has 4 optical coupler inputs and 4 potential-free relay outputs (shutters).

The maximum input voltage of the optical coupler is +24 V. Please mind the polarity. The breaking capacity per output relay is 24 V / 1 A.

X2 Internal circuit



9 Dimensions

