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**ATTENTION!**
*Please read through the whole user manual before using the device and accessories.*
1 General information

1.1 Notes on the user manual

The user manual is a part of the device and is included in its scope of supply. It enables safe and effective use of the device. It prevents operating errors as well as consequential personal or material damage.

Knowledge of the basic safety information and the safety regulations, as well as appropriate qualification of the operating staff, are basic prerequisites for the safe handling and trouble-free operation of the device.

All persons using the device must observe the information contained in these operating instructions, particularly the safety information. In addition, the rules and regulations on accident prevention applicable at the operating site must be observed.

Safety information and symbols

Warnings and symbols in this manual and on the device indicate hazards and must be observed in order to ensure safe operation. The symbols and signs used are listed and described in Chapter 6.

1.2 Customer service information

GAMPT mbH provides support for the product, offering advice and servicing (if possible) in conformity with the warranty conditions.

For additional information on GAMPT products and services, please contact GAMPT mbH.

Address: Gesellschaft für Angewandte Medizinische Physik und Technik mbH
Hallesche Straße 99F
06217 Merseburg

Phone: +49 3461/278691-0
Fax: +49 3461/278691-101
E-mail: info@gampt.de
2 Safety information

For your own safety and the operational safety of the device, please read the following safety information thoroughly prior to the commissioning of the measuring instrument and the ultrasonic sensors.

Please also observe the specific operational and safety information in the individual chapters.

2.1 Commissioning and operation

ATTENTION!

Please observe the following safety information for the commissioning and operation of the measuring instrument and the ultrasonic sensors.

- The device must be operated by authorized persons only. “Authorized persons” means those who have been instructed in the use of the device by a GAMPT employee or a person authorized by GAMPT. The authorization is documented in the handover report. In any other case, intended use is no longer ensured.

- When connecting the power supply, ensure that the voltage information on the external power supply unit of the device matches the mains voltage.

- Inspect the ultrasonic sensors for damage prior to every instance of use. Damaged sensors must be replaced. Do not use sensors if cracks are visible.

- Prior to connecting the ultrasonic sensors to the tube, apply a thin layer of gel to the active surfaces on the inside of the sensors. Ensure that the gel does not establish any direct contact between the contact surfaces in the sensor.

- Disconnect the ultrasonic sensors from the device by pulling on the plug; do not pull the cable. The same applies to all other connected device cables.

- The concurrent use of an HF coagulator during surgery can impact the measurement signal in the form of additional bubbles. This effect should be considered for the measurements and the evaluation of the data.

- Always exit the program prior to switching off the device.

PROHIBITED ACTIONS!

The actions listed below are prohibited.

- The device must not be used in a wet environment.

- Do not insert any objects into openings on the device, as this may lead to short circuits or electric shock.
• No external devices (keyboard, mouse, printer, network) may be connected during measurement in the operating room.

• Never attach the ultrasonic sensors to arteries or veins. They must be attached exclusively to the flexible blood tubes of the heart-lung machine.

### 2.2 Inspection and Maintenance

**ATTENTION!**

The system (device incl. probes) has to be inspected and maintained every two years. This takes place exclusively at the location of the company GAMPT.

**NOTE!**

GAMPT recommends an annual inspection and maintenance of the system.

### 2.3 Repair, cleaning and disposal

**ATTENTION!**

Please observe the following safety information for repair, cleaning and disposal of the measuring instrument and the ultrasonic sensors:

• The device must be opened by instructed service staff only. If opening the device is unavoidable, the device must be disconnected from the mains supply first.

• Clean the housing with a mild off-the-shelf detergent by wiping it with a cleaning cloth.

• Carefully clean the ultrasonic sensors with a moist cloth following each instance of use. Do not sterilize the sensors with gas.

• Dispose of the device and its accessories in accordance with the applicable national regulations.

**PROHIBITED ACTION!**

Do not use any chemicals containing alcohol or other aggressive chemicals for cleaning.
2.4 Transport and storage

For delivery, the measuring instrument and its accessories are packaged in cases. Use these cases also for transport and storage of the measuring system.

**ATTENTION!**

As an electronic measuring instrument with built-in PC, the device must be protected against moisture during transport and storage.

**CAUTION!**

The display may break. Secure the device accordingly during transport.
3 Description of the device

3.1 Intended use

The Bubble Counter BCC300 is a measuring instrument with documentation function and is used for the non-invasive and instant monitoring of air bubble activity in the blood in the extracorporeal circulation (ECC) of a heart-lung machine (HLM). The information on bubble activity is used for the continuous improvement of the quality of components in the extracorporeal circulation of the HLM and of the work of the staff operating the HLM.

The measurement recordings are used for documentation of bubble management during surgery and for the training of the operating staff, with the aim to increase their learning curve and to ensure high-quality bubble management in the long term.

3.2 Short description

The measuring instrument determines the number and the volume of bubbles in the µm range. The measured values are captured non-invasively from the outside, through the tube with up to three independently operating ultrasonic sensors. The measurement is based on an ultrasound Doppler system with automatic adjustment. This adjustment compensates for the impact of different parameters such as tube material, connection or blood concentration.

Together with the dedicated software, the BCC300 can be used both for the monitoring of bubble activity during the entire ECC and for the assessment of the performance parameters of individual components of the ECC regarding their bubble activity or bubble filtering. The recorded measured data is managed in a database system and can be evaluated with the aid of extensive tools.

3.3 Conformity

The Bubble Counter BCC300 complies with CE standards and with the requirements of Directive 2014/35/EU (Low Voltage Directive).

3.4 Classification

The device BCC300 with three connected ultrasonic sensors is classified as follows:

Type of protection against electric shock

- Device: Protection class 3
- PSU: Protection class 2
Degree of protection against water ingress

- **Device:** IP33, protection against splashing water (up to 60° from the vertical)
- **PSU:** IP20, no protection against water
- **Sensors:** IP44, protection against splashing water from any angle

The device is suitable for continuous operation.

### 3.5 Labeling

#### Measuring instrument

The rating plate of the BCC300 is attached to the back of the device. The rating plate shows information on power supply, model designation, serial number of the individual device, and other symbols and information. For an explanation of the symbols see Chapter 6.

![Rating plate of BCC300](image1)

*Fig. 3-1: Rating plate of BCC300*

#### Sensors

The ultrasonic sensors also feature a rating plate. The rating plate of an ultrasonic sensor shows the model designation, serial number of the individual sensor, tube size for which the sensor is designed, information on orientation of the sensor when connecting to a tube (arrow labeled FLOW) and other symbols and information. For an explanation of the symbols see Chapter 6.

![Rating plate ultrasound sensors](image2)

*Fig. 3-2: Rate plate ultrasound sensors*
3.6 Technical data

Dimensions
Measuring instrument: 266 mm × 239 mm × 64 mm
Ultrasonic sensors: 33 mm × 35 mm × 57 mm
(Cable length: 2 m)

Weight
Measuring instrument: 3.3 kg (4.0 kg with mounted VESA holder)
Ultrasonic sensors: 0.2 kg

Environmental conditions
Temperature
– Operation: 10–40 °C (50–104 °F)
– Storage/transport: -20 to +55 °C (-4 to +131 °F)
Relative humidity: 10–95 % at 40 °C, non-condensing

Power supply
External AC input: 100–240 V AC, 47–63 Hz
Output: 12 V DC, 5 A
Input power: max. 80 W

Measuring range and resolution
3 separate measuring channels: 20–2000 µm bubble size
Flow rate: 0.4–6 l/min (when 3/8” tubes are used)
ACC (Acoustic Coupling Control):
<15 %: too little reflected sound, no measurement possible
100 %: no or almost no attenuation by tube
typical: 30–70 % with 3/8” plastic tube (filled with water)

Precision
Every instrument and the corresponding ultrasonic sensors are supplied with a calibration report detailing the results of the calibration. In the flow range between 0.4 l/min and 6.0 l/min, the flow rate-dependent variation of the measured values is ≤ 3 dB.
Displays and outputs

The measured values are displayed on a built-in LCD touchscreen. Signal output via built-in loudspeakers can be switched off.

Ultrasound output specification

- Operating frequency: 2 MHz
- Operating mode: Burst excitation

The output level of the ultrasonic sensor connections is set at the factory and does not include any interactive system features. These settings are made according to ALARA principles ("as low as reasonably achievable") as acceptable limit values for sonification. These settings correspond to the requirements of the standard EN 60601-2-37 for the exemption from the mechanical index (MI) and thermal index (TI) regarding reporting during use.

- Transducer excitation: 2-6 waves per burst
- Transducer excitation frequency: 2 MHz
- Transducer excitation rate: 25 kHz

Tab. 3-1: Compliance with the requirements in accordance with IEC 60601-2-37

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Max. value as per IEC 60601-2-37</th>
<th>BCC300 sensor</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI</td>
<td>Mechanical index</td>
<td>1.0</td>
<td>0.032</td>
</tr>
<tr>
<td>TI*</td>
<td>Thermal index</td>
<td>1.0</td>
<td>0.041</td>
</tr>
<tr>
<td>IpTa</td>
<td>Spatial peak and temporal average value of intensity</td>
<td>100 mW/cm²</td>
<td>5 mW/cm²</td>
</tr>
<tr>
<td>IpPa</td>
<td>Spatial peak and pulse average value of intensity</td>
<td>-</td>
<td>72 mW/cm²</td>
</tr>
</tbody>
</table>

* BCC300 ultrasonic sensor working in non-sensing mode.

3.7 Equipment and accessories

The measuring system and the accessories are supplied in two cases. The following components are included in the scope of supply of the standard version:

- Measuring instrument BCC300 with pre-installed software
- External power supply unit including power cable
- Two ultrasonic sensors
- Equipotential bonding cable
- VESA holder for mounting of the instrument on the carrier system of the HLM
- Wireless keyboard and wireless mouse with USB wireless transmitter
- Ultrasound gel bottle
- User manual
- Calibration report

**ATTENTION!**

*Only use accessories recommended by GAMPT together with the BCC300.*

### 3.8 Tubes

The BCC300 has been tested for use with the following tubes (diameter: 3/8", wall thickness: 3/32") by GAMPT:

- Eurosets Class VI Implant Tested H LOT.17C21015
- Eurosets Class VI Implant Tested S LOT. 17C29007
- Medos Class VI M DEHP Free Lot. 14L19005
- Medos RB5 NDG ISO 10993 Tested
- Raumedic-ECC-noDOP
- Sorin Group Implant Tested Class VI XH
- Sorin Group Implant Tested Class VI XS
- Terumo Class VI  H DEHP FREE LOT. 16K03012
- Terumo Xcoating 101465
- Terumo Xcoating 101470

Other tubes may be used if tested by GAMPT.

### 3.9 Adverse effects and risks

The manufacturer currently has no knowledge of any adverse effects or risks if the products are used as intended.
4 Components, installation and operation

4.1 The BCC300 system

The Bubble Counter BCC300 by GAMPT mbH, Merseburg (Germany) is a measuring instrument to determine microbubbles in moving fluids. The BCC300 has been specifically designed for clinical applications and is equipped with a built-in panel PC with touchscreen for this purpose. The standard equipment includes two ultrasonic sensors for measuring on 3/8” plastic tubes. In addition, built-in USB ports allow the connection of USB devices, such as keyboard, PC mouse, printer, etc. This is particularly useful for evaluation and protocol creation after surgery. During measuring, all functions are controlled via the built-in touchscreen.

Fig. 4-1: Bubble Counter BCC300 by GAMPT mbH

During open-heart surgery, microbubbles may be generated. Their number and size depend on the current progress of surgery and the necessary manipulations of the heart-lung machine. If too many and too large bubbles enter the circulatory system of the patient, this can cause severe complications (gas embolism). Although heart-lung machines are equipped with arterial filters, monitoring the components of the extracorporeal circulation makes sense.

Based on the ultrasound Doppler method, the Bubble Counter BCC300 is capable of safely detecting and classifying microbubbles as small as 20 µm in diameter. Thanks to the device parameters, the
measuring system is suitable for both clinical application to monitor heart-lung machines and for laboratory testing of filter systems and oxygenators.

4.2 Views of the BCC300

4.2.1 Front view

Figure 4-2 shows the front view of the BCC300. During measuring, the device is operated entirely via the TFT LCD touchscreen.

Key
1. Handle
2. TFT LCD touchscreen
3. Power LED

Fig. 4-2: Front view of the BCC300
4.2.2 Rear view

**Fig. 4-3: Rear view of the BCC300**

<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Handle</td>
</tr>
<tr>
<td>2</td>
<td>Mounting holes for VESA holder</td>
</tr>
<tr>
<td>3</td>
<td>Connecting pin for equipotential bonding</td>
</tr>
<tr>
<td>4</td>
<td>Foldable foot</td>
</tr>
</tbody>
</table>

Figure 4-3 shows the rear view of the measuring instrument. Here you can find the threaded holes (VESA 100) for the device holder which can be used to attach the device to the frame of the heart-lung machine.

The device features a foldable foot to enable positioning it in a slightly inclined position (see also Chapter 4.4.2, page 21).

The rating plate of the BCC300 is also located on the back of the device (see Chapter 3.5, page 8).
4.2.3 Side views
4.2.3.1 Connections on the left side of the device

The left side of the device features three sockets for the connection of the ultrasonic sensors. Connected ultrasonic sensors are automatically detected and checked by the system.

**ATTENTION!**

*When connecting an ultrasonic sensor to the device, ensure that the connection markings (red dots) on the sensor plug and the connection socket on the device are facing each other.*
### 4.2.3.2 Connections on the right side of the device

![Right side view of the BCC300](image)

**Key**

1. USB ports
2. ON/OFF button
3. Connection socket for power supply
4. Connecting pin for equipotential bonding

**Fig. 4-5: Right side view of the BCC300**

The right side of the device features the ON/OFF button, the mains socket, two USB ports and the connecting pin for equipotential bonding.

To switch on the device, briefly push the ON/OFF button once. When switched on, the ON/OFF button and the power LED on the front side of the device light up in blue.

**NOTE!**

*It may take a few seconds for the device to start up after the On/Off button has been pushed.*
To switch off the device, push and hold the ON/OFF button until the button’s illumination and the power LED on the front of the device turn off. Alternatively, the device can also be switched off via the measuring software (see Chapter 5.7).

**ATTENTION!**
Ensure that the measuring software has been shut down before switching off the device using the ON/OFF button in order to prevent any data loss.

The supplied external power supply unit is connected to the power connection socket and to the mains (Europe: 230 V, 50 Hz, USA: 115 V, 60 Hz) using the appropriate power cable.

**CAUTION!**
It is imperative that the voltages and amperages indicated on the device and the external power supply unit are observed.

In addition, there are two USB ports on the right side of the device, which can be used to connect the USB devices included in the scope of supply or other USB devices (see Chapter 4.4.2, page 21).

### 4.2.4 Bottom view of the BCC300

![Bottom view of the BCC300](image)

*Fig. 4-6: Bottom view of the BCC300*
Key
1  Foldable foot
2  Connecting pin for equipotential bonding
3  Loudspeaker openings

On the underside of the device, on the left and right, there are openings for the loudspeakers for optional output of the measured signal as an audio signal.

NOTE!
The audio signal is only used for orientation and control during measuring, as the perceived amplitude depends on the frequency and may not exactly indicate the actual bubble size.
4.3 Ultrasonic sensors

Fig. 4-7: Structure of the ultrasonic sensors

Key
1 Slots for locking pins
2 Contact surface in the sensor cover
3 Foldable sensor cover
4 Sensor body
5 Contact surface in the sensor body
6 Sensor fastener
7 Locking pins
8 Sensor plug with cable

The ultrasonic sensors by GAMPT mbH for the BCC300 enable the measurement on 3/8" tubes (or others) in flowing fluids. Cover and fastener of the ultrasonic sensors are movable, so that the sensors can be positioned around the tube and secured without any problems.

The ultrasonic sensors are color-coded (blue, red or green). Individual sensor elements can be designed in the color of the respective coding. The sensors are automatically detected by the software. As delivered, the software defines the colors for the representation of the measured data (values, curves) and regarding the clear allocation of the three measuring channels in accordance with the color coding of the connected ultrasonic sensors.
4.4  Mounting and installation of the measuring instrument

4.4.1  Use with the heart-lung machine

For clinical applications, the device can be attached to the frame of the heart-lung machine using the VESA holder included in the scope of supply. Four threaded holes are provided on the back of the device for attachment of the VESA holder (see figure 4-3, page 14).

![Device with mounted VESA holder](image)

**ATTENTION!**

*For the use of the measuring system on the heart-lung machine, the following safety information must be observed:*

- When mounting the BCC300 on a carrier system of the heart-lung machine, a holder by GAMPT should be used.

- The measuring instrument including the holder must be attached to the frame of the heart-lung machine in a way that prevents shifting or twisting.
• **Sensor and power cables must be positioned in a way that they do not hinder the persons in the operating room in their work.**

• **The device must be connected with a suitable equipotential bonding connection on the carrier system of the heart-lung machine via the equipotential bonding cable included in the scope of supply.**

• **During measurement in the operating room, no external devices (keyboard, mouse, printer, …) must be connected! The measuring instrument is operated via the touchscreen interface of the device.**

### 4.4.2 Use on an even working surface

By means of the foldable foot (see e.g. figure 4-3), the device can be positioned in a slightly inclined position, so that optimal ventilation is ensured and the device is securely footed.

The USB devices included in the scope of supply (transmitter of the wireless keyboard, flash drive) as well as additional off-the-shelf USB devices (printer, keyboard, mouse, etc.) can be connected in this position.

This enables the use of the device e.g. like a regular Windows PC for data evaluation and documentation in the office.

**ATTENTION!**

*For notes on connection, installation and operation of additional USB devices see the applicable manufacturer information.*

### 4.4.3 Handling of the ultrasonic sensors

**PROHIBITED ACTION!**

*Never attach the ultrasonic sensors to arteries or veins. They must be attached exclusively to the flexible blood tubes of the heart-lung machine.*

Depending on the measuring task, it is recommended to attach the ultrasonic sensors to the tube upstream and downstream of the component to be measured, respectively.

To attach an ultrasonic sensor on the tube, carry out the following steps:

1. For a better acoustic coupling, apply ultrasound gel to the contact surfaces.
NOTE!

Use only a small amount of ultrasound gel. A thin gel film is sufficient for the acoustic coupling. All ultrasound gels available in the medical retail trade may be used.

2. Insertion of the tube into the sensor body (figure 4-10, item A).
NOTE!
Ensure that the direction of flow indicated on the sensor (arrow labeled FLOW) matches the direction of flow of the fluid inside the tube (figure 4-10, item H). Generally, a distance of approx. 10-20 cm to other components should be kept.

3. Press the sensor fastener against the sensor body (figure 4-10, item B).
4. Turn over the sensor cover and press on (figure 4-10, items C-E).
5. Then slowly release the sensor fastener, letting the locking pins lock into the openings on the sensor cover (figure 4-10, items F-G).

To open the sensor, press the sensor fastener against the sensor body until the locking pins are released and the clamped tube pushes open the sensor cover.

Fig. 4-11: Ultrasonic sensor around 3/8" tube (entirely closed).
ATTENTION!
Observe the following safety and operating instructions when handling the ultrasonic sensors:

- Apply a thin layer of ultrasound gel to the contact surfaces of the sensors.
- Keep the required distance to other sensors and components of the circulation.
- For a reproducible measuring signal, it is imperative that the fastener is entirely closed.
- Attach the sensors to the tubes in such a way that the direction of flow indicated on the rating plate of the sensors matches the direction of flow of the fluid in the tubes.
- Only use tubes in matching sizes with the sensors (e.g. 3/8” tubes with 3/8” sensors).
- Only tubes tested by GAMPT should be used.

NOTE!
Prior to using special tubes, please contact GAMPT mbH or send us a sample (minimum length 50 cm) for test measurements.

4.5 Testing the device

The proper functionality of the BCC300 can be tested using a suitable glass bead suspension.
5 Software

The following pages describe the software BCC300, version number 3.1.0.0. Other versions may differ slightly.

NOTE! The software is continuously supplemented and revised. For the latest update, please visit the website www.gampt.de and go to “Downloads/Software”, or contact GAMPT mbH at info@gampt.de.

5.1 Overview

The software BCC300 is a measuring, evaluation and documentation program for the Bubble Counter Clinical (BCC300).

In general, the software is started automatically when the device is switched on and the operating system is started up. Alternatively, the software can be started by calling up the file Bcc300.exe (link on the desktop or in the install directory).

Upon starting the program, various initializations and internal tests are running. Following initialization, the main menu (figure 5-3) is displayed and the program awaits an input by the user.

When using the device on the heart-lung machine, the program is operated via the touchscreen of the device. Entries into data fields are made using the virtual keyboard, which can be shown and hidden via EDIT and EDIT.
When operating the device independent of the heart-lung machine, the program can be controlled using the wireless keyboard included in the scope of supply; in this case, the corresponding wireless transmitter must be plugged into one of the two USB ports on the device. Alternatively, you can also connect off-the-shelf input devices, such as a keyboard or a mouse, to the USB ports.

5.2 Main menu

Fig. 5-3: Main menu of software
Upon initialization of the software, the main menu is displayed on the touchscreen. Starting from the main menu, you can manage patient data and measurements, perform new measurements and select already existing measurements from the database and evaluate them.

In addition, system settings can be displayed and the menu for the setting of device parameters can be opened.

The currently connected and detected sensors are displayed in the lower left corner of the main menu.

5.3 Database

With the database, the user can quickly and easily manage patient data and associated measurements. The measured data themselves are not stored in the database, but in external files. The connection between these external files and the information the user enters for the individual measurements is implemented via the database. Chapter 5.4, starting on page 42, describes how the actual measurements are carried out.

To open the database, tap the symbol DOCUMENTATION in the main menu. The offline documentation mode is started and the database interface is displayed (figure 5-4).
**Tab. 5-2: Symbols of the database interface**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="play.png" alt="Play" /> <img src="stop.png" alt="Stop" /></td>
<td>Jump to first/last database entry (patient, measurement)</td>
</tr>
<tr>
<td><img src="previous.png" alt="Previous" /> <img src="next.png" alt="Next" /></td>
<td>Jump to previous/next database entry (patient, measurement)</td>
</tr>
<tr>
<td><img src="add.png" alt="Add" /> <img src="delete.png" alt="Delete" /></td>
<td>Create new patient/Delete entry (patient, measurement)</td>
</tr>
</tbody>
</table>
| ![Archive](archive.png) | SHOW ARCHIVE MENU  
Shows the functions for the archiving of measured data |
| ![Import](import.png) | IMPORT  
Calls up the menu for the import of archived data |
| ![Edit](edit.png) | SHOW/HIDE EDIT  
Shows and hides the screen to edit database entries |
| ![Menu](menu.png) | CENTRAL MENU  
Calls up the main menu |
The administration within the database features two levels. The information on the patient (name, sex, ...) is entered at the first level. The measurements stored for each patient are managed at the second level.

### 5.3.1 Administration of patient data

Patients are created or selected and patient data is edited in the top section of the database interface (figure 5-4). Miscellaneous information (name, date of birth, sex, diagnosis, etc.) can be entered for each patient.

**Creating a new patient**

New patients are created with 🎨. To edit the individual data fields, it is necessary to display the virtual keyboard 📋 SHOW EDIT in touchscreen mode. In input mode, the input screen for the patient data is displayed in the top section and the virtual keyboard is displayed in the bottom section. To exit the input mode, tap 📋 HIDE EDIT.
Selecting/changing a patient

Generally, all editable fields can also be changed later. To select a specific patient, tap the according input line or the symbols for jumping forward and back (← → ←). The input line of the selected patient is highlighted in color.

Deleting a patient

With Deletes, the currently selected patient is deleted from the database.

CAUTION!

When a patient is deleted, both the information on the patient, the information on the measurements concerning this patient and the associated measured data are deleted. For security reasons, any deletion must therefore be explicitly confirmed.

5.3.2 Administration of measurements

The bottom half of the database interface (figure 5-4) is used to manage the measurements. It always displays the measurements linked to the patient selected in the top half of the database interface.
Selecting/changing a measurement

A specific measurement can be selected by tapping the corresponding input line or the symbols for jumping forward and back (← →). The input line of the selected measurement is highlighted in color. To edit the input fields for a measurement (Observer and Note), it is necessary to display the virtual keyboard SHOW EDIT in touchscreen mode. In input mode, the input screen for the patient data and the selected measurement are then displayed in the top half of the touchscreen (figure 5-6). To exit the input mode, again tap HIDE EDIT.

Fig. 5-6: Editing the database entry of a measurement

Deleting a measurement

With , the currently selected measurement including the associated measurement data is deleted. The deletion of a measurement requires confirmation.

NOTE!

In the offline documentation mode, no measurements can be created. Measurements are created every time a measurement is started (see chapter 5.4).
### 5.3.3 Evaluating a measurement

By tapping the symbol **OFFLINE ANALYSE** in the lower right corner of the database interface the program switches to the offline documentation mode. In this mode, the measurement selected with the database interface can be evaluated and documented.

![Screen for the evaluation of a measurement – Time course diagram in ZOOM mode](image)

*Fig. 5-7: Screen for the evaluation of a measurement – Time course diagram in ZOOM mode*
Fig. 5-8: Screen for the evaluation of a measurement – Time course diagram in ROI mode

Tab. 5-3: Symbols shown on the evaluation screen

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>←</td>
<td>CENTRAL MENU&lt;br&gt; Calls up the main menu</td>
</tr>
<tr>
<td>ASCII export of measured data</td>
<td></td>
</tr>
<tr>
<td>REPORT</td>
<td>Opens the report screen to generate a report</td>
</tr>
<tr>
<td>SCREENSHOT</td>
<td>Takes a screenshot of the current screen</td>
</tr>
</tbody>
</table>

**Footer**

**Bubble distribution diagram**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZOOM</td>
<td>ZOOMS IN / ZOOMS OUT THE DISPLAY RANGE OF THE X AXIS</td>
</tr>
<tr>
<td>←</td>
<td>DISPLAYS OR HIDES OVERRANGE BUBBLES</td>
</tr>
</tbody>
</table>
### Time course diagram

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="... Scale" /></td>
<td>Switches the scaling of the Y axis (linear</td>
</tr>
</tbody>
</table>

### Time course diagram in ZOOM mode

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>![zoom out</td>
<td>zoom in](image)</td>
</tr>
<tr>
<td><img src="image" alt="grid" /></td>
<td>Displays grid lines in the time course diagram</td>
</tr>
<tr>
<td>![zoom x</td>
<td>zoom y](image)</td>
</tr>
<tr>
<td><img src="image" alt="zoom undo" /></td>
<td>Reverts the last zoom steps</td>
</tr>
<tr>
<td><img src="image" alt="zoom off" /></td>
<td>Resets the zoom settings</td>
</tr>
</tbody>
</table>

### Time course diagram in ROI mode

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>![shift left</td>
<td>shift right](image)</td>
</tr>
<tr>
<td>![increase roi</td>
<td>decrease roi](image)</td>
</tr>
<tr>
<td><img src="image" alt="reset roi" /></td>
<td>Removes the selected ROI range</td>
</tr>
</tbody>
</table>

The displayed screen is divided into three sections:

A) Bubble Distribution (top left) – overall distribution of the measured bubble sizes  
B) Total Activity (top right) – cumulated overall values  
C) Time Course (bottom) – chronological sequence of measurement

#### A) Distribution of bubble sizes (histogram)

In the top left corner, one diagram per measuring channel is displayed showing the size distribution of all measured bubbles.

The display range of the X axis (bubble size) can be enlarged or reduced using the zoom functions.

Additionally, can be used to show the number of overrange bubbles (with a diameter in excess of 2000 µm) as a single bar at the right end of the diagram.
The time range shown in the diagram title [00:00:00 - ...] indicates the measuring range across which the bubble distribution and the total activity (see item B) below) are determined. This time range corresponds to the ROI selected in the time course diagram. If no ROI has been selected, the evaluation is applied to the entire measurement.

**NOTE!**

*If the time course diagram is in ZOOM mode and a ROI has been selected, the time range indicated in the diagram title of the histogram changes color and flashes in order to point out the limited evaluation range.*

B) Total activity

The total activity for each measuring channel is indicated in the top right corner regarding the following dimensions:

- **Number** - total number of all measured bubbles
- **Overranged** - number of overrange bubbles (larger than 2000 µm)
- **Volume** - total volume of all measured bubbles

**NOTE!**

*The determined total activity always refers to the time range of the measurement indicated in the bubble histogram (see above).*

C) Time course of measurement

The bottom section of the evaluation screen displays the chronological sequence of measurement. The course over time is the result of values cumulated or averaged over a time interval of one second. With ➤, the Y axis can be displayed either on a linear or logarithmic scale.

It is also possible to switch between two display types – ZOOM and ROI.

**ZOOM** – In this mode, the data is evaluated regarding the distribution of the bubble sizes (top left) and the total activity (top right) based on the entire data record of a measurement. The respective display range of the X and Y axes can be enlarged or reduced using the zoom functions (see figure 5-7 and table 5-3). To zoom the X axis, a minimum measurement duration of 5 minutes is required. Zoomed diagram content can be moved in parallel with the axes in the diagram window. To do so, tap the X or Y axis and move the finger over the screen along the axis and in the desired direction.

**ROI** (Region of Interest) – In this mode, a specific time range can be defined for the data evaluation regarding the distribution of bubble sizes (top left) and the total activity (top right). Upon the first switch to the ROI mode, the entire measurement is automatically selected as the ROI. Using the finger or the mouse, a smaller section can now be zoomed into
as the ROI. The ROI range is distinguished by colored highlighting. Using the symbols on the right, below the time course diagram (see figure 5-8 and table 5-3), the selected ROI can be enlarged, reduced and moved on the time axis. With reset roi, the entire measurement is selected as the ROI.

The smallest selectable ROI range is one minute. In case of shorter measurements, the ROI is always equal to the entire measurements.

The corresponding button on the right side of the diagram can be used to select the time course to display.

**NUMBER** – Time course of the cumulated number of bubbles detected across a specific time interval of one second.

**VOLUME** – Time course of the cumulated volume of bubbles detected across a specific time interval of one second.

**DOPPLER SHIFT** – Time course of the averaged Doppler shift across a specific time interval of one second.

**ACC** (Acoustic Coupling Control) – Time course of the averaged ACC value across a specific time interval of one second.

In addition to bubble size, the actual measured signal, the dimension of the measured signal also depends on the acoustic properties of the measuring system. Besides the coupling between sensor and tube, this also includes the sound attenuation in the tube or in the medium. The ACC is a measure of these properties. It is continuously monitored during the measurement and used to correct the measured signals. If the properties change during measurement, e.g. due to the medium or the tube material getting warmer, the measuring system registers this and applies the appropriate corrections. If the ACC value is too low, the measured signal level is no longer sufficient for a quantitative evaluation.

**TC HISTOGRAMM** – Time course of the cumulated size distribution of the bubbles detected across a specific time interval of one second.
5.3.4 Report preparation

By tapping the symbol REPORT in the bottom right corner of the evaluation screen, a summary report of the evaluated measurement is generated. The report can be saved as a PDF file.

5.3.5 Archiving of measurements (export of data)

A backup of data can be created using the archiving function of the software. In the process, the software looks up all relevant data from the database as well as the files in which the measured values are stored and exports them to compressed 7z files. A 7z file is created for every selected measurement.

**NOTE!**

*It is recommended to use a mouse and keyboard to control the archiving and import functions.*

By tapping SHOW ARCHIVE MENU, additional functions for the archiving of single or multiple measurements are displayed.
Fig. 5-10: Database interface with activated archiving functions

Tab. 5-4: Symbols shown on the database interface in the archiving view

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>🔄 ▶️</td>
<td>Jump to first/last database entry (patient, measurement)</td>
</tr>
<tr>
<td>🔄 ◀️</td>
<td>Jump to previous/next database entry (patient, measurement)</td>
</tr>
<tr>
<td>🔄 ▶️</td>
<td>Create new patient/delete entry (patient, measurement)</td>
</tr>
<tr>
<td>✔️</td>
<td>Mark all patients/measurements for archiving</td>
</tr>
<tr>
<td>✔️</td>
<td>Mark selected patient/selected measurement for archiving</td>
</tr>
<tr>
<td>✗</td>
<td>Cancel all markings for archiving</td>
</tr>
</tbody>
</table>
| 🗂️ | SELECT ARCHIVE PATH  
Selects the archive directory |
| 🗂️ | ARCHIVE  
Executes the archiving |
## Symbol Description

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
</table>
| ![HIDE ARCHIVE MENU](image) | HIDE ARCHIVE MENU  
Hides the menu item for the archiving of measurements |
| ![IMPORT](image) | IMPORT  
Calls up the menu for the import of archived data |
| ![SHOW/HIDE EDIT](image) | SHOW/HIDE EDIT  
Shows/hides the form for the editing of database entries |
| ![CENTRAL MENU](image) | CENTRAL MENU  
Calls up the main menu |
| ![OFFLINE ANALYSE](image) | OFFLINE ANALYSE  
Opens the screen for evaluation of the selected measurement |

In the archiving view of the database, a menu item is shown under the table of measured data which can be used to select the archive directory and set the compression ratio of the exported 7z files.

By additional buttons to the left of the table of patients or the table of measured data, the data to be archived can be selected. The selected data is displayed in a different font and color.

- **Table of patients:** ![✓](image) marks a selected patient and ![✓](image) marks all patients. In addition, all measurements of the marked patients are automatically selected for archiving. ![✗](image) resets all markings in the table of patients.
  
  If at least one of the measurements for a patient has been marked for archiving, the patient is displayed in a different color. If all the measurements for a patient have been marked for archiving, the patient is also displayed in bold and italic characters.

- **Table of measured data:** ![✓](image) marks a selected measurement and ![✓](image) marks all measurements. The measurements marked for archiving are displayed in colored, bold and italic characters. ![✗](image) resets all markings in the table of measured data.

By tapping ![ARCHIVE](image), the marked data is written to the selected archive directory as 7z files. The filenames are generated automatically. The consist of the patient ID (PID) and the measurement ID (MID). PID and MID include the time the respective database entries were made. In addition, the **Observer** and **Record Note** information from the respective measured data entry is attached to the filenames. By tapping ![SHOW EDIT](image), the input screen to edit the database entries of the selected measurement can be opened.
5.3.6 Importing archived measured data (import of data)

Using the import function, archived data can be copied into the database by the software, e.g. for evaluation at a later time or on another computer.

By tapping IMPORT, the menu for the import of data is opened. The archive directory and the data to be imported can be selected and copied into the database here.

![Menu for the import of data](image)

**Fig. 5-11: Menu for the import of data**

**Tab. 5-5: Symbols used on the database interface in the archiving view**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
</table>
| ![Folder](image) | SET ARCHIVE PATH  
Selects the desired archive directory |
| ![Select all](image) | select all  
Selects all archived files |
| ![Cancel](image) | cancel  
Closes the selection window without importing any data |
<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>✔️</td>
<td>import</td>
</tr>
<tr>
<td></td>
<td>Executes the import of data from the selected archived files</td>
</tr>
</tbody>
</table>
5.4 Measurements

By tapping the symbol ▶ MEASUREMENT in the main menu (figure 5-3), the measuring mode of the program is started. A measurement is carried out in three steps:

1. Creating a measurement
2. Check of the connected sensors
3. Carrying out the measurement

NOTE!
The maximum length of a measurement is limited to 10 hours.

5.4.1 Creating a measurement

After calling up the measuring mode, the database interface is opened first (figure 5-12).

In the top half (as described in chapter 5.3.1, starting on page 29), a patient can be selected or newly created.
In the bottom half, a new measurement is automatically created for the selected patient. Already existing measurements are displayed here. They cannot be selected to prevent overwriting of measured data. The input fields are edited as described in chapter 5.3.2, starting on page 30.

**NOTE!**

*In measuring mode, no measurements can be deleted. This is only possible in the offline documentation mode (see chapter 5.3.2).*

After selecting the patient and creating the measurement, the sensor check is started by tapping the symbol **PROBE CHECK** in the lower right corner of the screen.

### 5.4.2 Sensor check

In the second step of carrying out a measurement, the software checks the connected ultrasonic sensors and opens the setup screen for the sensors.

![Screen for sensor setup](image)

*Fig. 5-13: Screen for sensor setup*
The display shows three vertically arranged sections corresponding to the three BCC boards (measuring channels) of the device. The order of these three sections from top to bottom corresponds to the sequence of the sensor connections on the left side of the device (see figure 4-4).

The color coding and the serial number of the respective connected sensors is shown on the left. The current ACC value (see page 47) is also shown. It is continuously updated until the actual measurement is started.

On the right, one of three colors can be assigned to the sensor or measuring channel. This is done by tapping the color field, resulting in three color options being displayed. These colors are then used on the measurement screen to illustrate the measured values and curves. The colors generally match the colors blue, red and green of the sensor coding.

**NOTE!**

On the SETTINGS page, additional color combinations consisting of three colors each can be selected (see chapter 5.5.3, page 52).

**ATTENTION!**

To ensure a clear allocation of the measured data regarding the sensors or measuring channels, no color may be assigned more than once, even if several ultrasonic sensors with the same color coding can be connected to the device and operated at the same time.

After the sensor check and the color assignment, the actual measurement operation can be started by tapping the symbol ➔ **START MEASUREMENT** in the lower right corner of the screen.
5.4.3 Carrying out the measurement

![Program interface in measuring mode](image)

Tab. 5-6: Symbol used on the evaluation screen

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="END" /></td>
<td>END&lt;br&gt;Finishes the current measurement</td>
</tr>
<tr>
<td><img src="image" alt="SUSPEND" /></td>
<td>SUSPEND&lt;br&gt;Suspends the current measurement</td>
</tr>
<tr>
<td><img src="image" alt="RESUME" /></td>
<td>RESUME&lt;br&gt;Continues the suspended measurement</td>
</tr>
<tr>
<td><img src="image" alt="SOUND" /></td>
<td>SOUND&lt;br&gt;Sets up the acoustic bubble signal</td>
</tr>
<tr>
<td><img src="image" alt="COMMENT" /></td>
<td>COMMENT&lt;br&gt;Adds predefined comments to the time course diagram</td>
</tr>
<tr>
<td><img src="image" alt="SCREENSHOT" /></td>
<td>SCREENSHOT&lt;br&gt;Creates a screenshot of the current screen</td>
</tr>
</tbody>
</table>
During the measurement operation, the screen shown in figure 5-14 is displayed, which is subdivided into the following four sections:

A) Current Activity (top left) – current bubble activity
B) Bubble Distribution (top center) – overall distribution of all measured bubble sizes
C) Total Activity (top right) – cumulated overall values
D) Time Course (bottom) – chronological sequence of the current measurement

A) Current bubble activity

In the top left section, one diagram is shown per measuring channel or sensor displaying the bubbles detected over the last 80 milliseconds and their size. The position on the Y axis corresponds to the bubble size.

NOTE!
If, during measurement, the value of the Acoustic Coupling Control drops below 15 %, an according warning – ACC – is displayed above the diagram of the respective measuring channel.
If an ultrasonic sensor is incorrectly positioned (see chapter 4.4.3), FLOW is displayed as a warning.

B) Distribution of bubble sizes (histogram)

In the top center section, one diagram is shown per measuring channel or sensor displaying the distribution of sizes of all bubbles detected since the start of the measurement operation.

The display range of the X axis (bubble size) can be enlarged or reduced using the zoom functions and .

In addition, can be used to show or hide the number of overrange bubbles (bubbles with a diameter larger than 2000 µm) as a single bar to the right of the diagram.

C) Total activity

In the top right section, the activity regarding the following dimensions is indicated per measuring channel or sensor:

- **Number** - overall number of all measured bubbles and below
  - **Overranged** – number of overrange bubbles (bubbles larger than 2000 µm)
- **Volume** - overall volume of all measured bubbles
- **ACC** - current value of Acoustic Coupling Control
D) Time course of measurement

In the bottom section of the evaluation screen, the chronological sequence of the measurement is displayed.

The time course is the result of values cumulated or averaged across a specific time interval of one second. The maximum time range displayed by default is 30 minutes. If the measuring duration exceeds the maximum setting, the program automatically scrolls the measuring curves to the left. For the Y axis, linear or logarithmic scaling can be selected.

The corresponding buttons to the right of the diagram can be used to select which specific time course will be displayed.

- **NUMBER** – Time course of the cumulated number of bubbles detected across a specific time interval of one second.
- **VOLUME** – Time course of the cumulated volume of the bubbles detected across a specific time interval of one second.
- **DOPPLER SHIFT** – Time course of the averaged Doppler shift across a specific time interval of one second. The Doppler shift is a measure of the flow velocity or flow rate.
- **ACC (Acoustic Coupling Control)** – Time course of the averaged ACC value across a specific time interval of one second each.

In addition to bubble size, the actual measured signal, the dimension of the measured signal also depends on the acoustic properties of the measuring system. Besides the coupling between sensor and tube, this also includes the sound attenuation in the tube or in the medium. The ACC is a measure of these properties. It is continuously monitored during the measurement and used to correct the measured signals. If the properties change during measurement, e.g. due to the medium or the tube material getting warmer, the measuring system registers this and applies the appropriate corrections. If the ACC value is too low, the measured signal level is no longer sufficient for a quantitative evaluation. In this case, an according warning is issued (see above).

- **TC HISTOGRAMM** – Time course of the cumulated size distribution of the bubbles detected across a specific time interval of one second.

5.4.4 Suspending and ending a measurement

A measurement can be suspended and resumed at any time. A measurement is suspended by tapping the symbol **SUSPEND** to the left below the time course diagram. The label **SU** appears at the top of the diagram. The measurement is resumed by tapping the symbol **RESUME**. In this case, the label **RE** appears in the time course diagram. In addition, a suspension is indicated by the words "Measurement suspended" flashing in the top left corner of the screen.
A measurement is ended by tapping the symbol END, which results in the software, after prompting the user, automatically returning to the offline documentation mode (see chapter 5.3.3, page 32) for evaluation of the measurement carried out. However, evaluation and report preparation of a measurement can also be carried out at any later time if the measurement has not been deleted.

5.4.5 Commenting on a measurement

A measurement can be commented on while it is carried out (e.g. to document the addition of additional substances). Tapping the symbol COMMENT opens a selection box with 10 predefined comment texts. Following the selection of a comment, a label showing a comment identifier - e.g. C1 - is displayed in the time course diagram and the comment text is saved.

The comments (text and identifier) can be defined in the settings menu (see chapter 5.5.2, page 52).

5.4.6 Event labeling

When certain events occur during the measurement, the following markings or warnings are automatically entered in the time course diagram.

<table>
<thead>
<tr>
<th>Marking / Warning</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>AU (ACC Underrange)</td>
<td>ACC value is too small (no measurement possible)</td>
</tr>
<tr>
<td>FO (Filter On)</td>
<td>Filter for interference suppression is switched on</td>
</tr>
<tr>
<td>FX (Filter Off)</td>
<td>Filter for interference suppression is switched off</td>
</tr>
<tr>
<td>RE (Resume)</td>
<td>Measurement is resumed</td>
</tr>
<tr>
<td>SP (Screen Print)</td>
<td>Screenshot is created</td>
</tr>
<tr>
<td>SU (Suspend)</td>
<td>Measurement is suspended</td>
</tr>
<tr>
<td>WD (Wrong flow Direction)</td>
<td>Sensor orientation does not match the direction of flow</td>
</tr>
</tbody>
</table>

5.4.7 Sound

Bubbles can also be indicated by an acoustic signal during measurement. A sound is emitted for each bubble, the frequency (pitch) of which is determined by the speed of the bubble.
By default, this sound output is switched off. Tapping `SOUND` opens a setting window, in which the measuring channels (Device A to C) for the acoustic bubble signal can be selected, the sound volume can be set and the sound output can be muted.

![Fig. 5-15: Sound settings](image)
5.5  Program settings

By tapping the symbol SETTINGS in the main menu, a menu is opened which can be used to define various program settings. The setting options and parameters are grouped and the groups can be called up using the tabs on the left side of the screen.

5.5.1  Diagram options and measurement parameters

![Diagram settings](image)

Fig. 5-16: Diagram settings

The tab Options in the setup menu can be used to set up the following parameters:

A) Measurement parameters

- **Bubble Threshold** – This parameter determines the minimum bubble size registered.
- **Channel Threshold** – This parameter determines the minimum bubble size counted.

The minimum detectable bubble size depends first and foremost on the hardware used and is stated in chapter 3.6 on page 9.
Under certain circumstances, however, it may be useful not to use the smallest possible resolution for measurement. This is the case e.g. when noise or disturbances are too strong or when small bubbles which do not exist are displayed due to pump reel strokes. The values Bubble Threshold and Channel Threshold described above enable the user to define a minimum threshold.

If the size of a bubble exceeds the Bubble Threshold, it is registered as a bubble, stored and further evaluated. If the bubble is too small, it is ignored and the program continues with the next bubble.

The next step checks if the registered bubble exceeds the Channel Threshold. If this is the case, it is classified, assigned the respective histogram channel (Bubble Distribution) and accordingly included in the time course. If the bubble is too small, it is ignored for the further evaluation.

Please note that both values are minimum filter thresholds. The Bubble Threshold initially decides whether the bubble is saved. The Channel Threshold then decides whether the bubble is evaluated and displayed. The higher the Bubble Threshold is, the fewer small bubbles are registered and saved, the corresponding data files become smaller and the evaluation is faster. The drawback is that bubbles, once rejected, cannot be evaluated later. On the other hand, the Channel Threshold only impacts the currently displayed data. It can be varied e.g. regarding the evaluation.

**NOTE!**

*The Channel Threshold should not be lower than the Bubble Threshold.*

### B) Storage parameters

**Save Raw Signal** – This parameter defines whether the raw data (original measured data) should be saved.

By saving the raw data, the measurement can be tracked in the offline mode at a later time. This can be helpful for troubleshooting or the examination of specific influence factors.

**NOTES!**

- *The raw data can be evaluated by GAMPT only.*
- *The function for saving the raw data is disabled by default, as it produces very large quantities of data.*
5.5.2 Comments

During a measurement, predefined comments can be saved which are displayed by corresponding labels in the time course diagram. The comments can be changed via the tab Comment of the settings menu.

Comments consist of:

- a comment text with a maximum of 52 characters (e.g. Heart Operation) and
- an abbreviation with a maximum of two characters (e.g. HO) as a label in the time course diagram.

5.5.3 Channel settings

The tab Channel Settings of the settings menu can be used to set up the identification of the measuring channels by color and name. These colors and names are used on the measurement screen or the screen for the evaluation of a measurement to clearly assign measured values and curves to the respective sensors or measuring channels.
Channel Colors

By enabling the corresponding checkbox, one of three color groups can be selected. Each color group consists of three different colors which are assigned to one sensor (one measuring channel) when a measurement is carried out.

The colors are used to represent the measured values or curves. This way, the curves can be assigned to the respective sensor (measuring channel) e.g. in the time course diagram.

Channel Names

By enabling the corresponding checkbox, one of three identifier groups can be selected. The identifiers are used to identify the three measuring channels by name in the program.

The first two identifier groups are fixed, whereas the third group can be freely selected.
5.6 System information

Fig. 5-19: Display of system information

Tapping the symbol **SYSTEM INFORMATION** in the main menu opens the display of the system information:

- Contact data such as address, phone etc.
- Revision number of software
- Revision number of device firmware
- Serial numbers of BCC Boards (measuring channels)
- Additional technical parameters

**NOTE!**

*If any problems occur, the system information can be written to a PDF file with **SAVE SYS INFO** and can be send to GAMPT by email together with a description of the problem and further requested data.*
5.7 Exiting the program

Tapping the symbol \( \text{EXIT} \) in the main menu (figure 5-3), exits the program. The options described below are available for exiting the program.

- **SHUTDOWN**
  Exits the program and shuts down the PC

- **HIBERNATE**
  Exits the program and puts the PC into hibernation mode

- **WINDOWS**
  Exits the program and returns to the Windows desktop

- **CANCEL**
  Return to main menu (the program is not exited)
6 Symbols and signs

The following tables provide an overview of symbols and associated definitions. Please note that some symbols apply to specific products only. The term “device” may apply to the following components: measuring instrument (BCC300), sensor or other components (accessories).

Tab. 6-1: Symbols used in the user manual

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="attention" /></td>
<td>ATTENTION! The symbol indicates notes and information on measures which must be observed and/or carried out.</td>
</tr>
<tr>
<td><img src="image" alt="caution" /></td>
<td>CAUTION! The symbol indicates that failure to follow instructions may lead to injury of users or damage to the device.</td>
</tr>
<tr>
<td><img src="image" alt="prohibited" /></td>
<td>PROHIBITED ACTION! The symbol indicates actions which are prohibited.</td>
</tr>
<tr>
<td><img src="image" alt="note" /></td>
<td>NOTE! The symbol indicates specific notes on operation of the device and of the software.</td>
</tr>
</tbody>
</table>

Tab. 6-2: Symbols used on the measuring instrument (BCC300) and on the ultrasonic sensors

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="attention" /></td>
<td>Attention – refer to the accompanying documentation The information in this user manual and in the package inserts of the individual devices must be observed.</td>
</tr>
<tr>
<td><img src="image" alt="device_class" /></td>
<td>Device of protection class 2</td>
</tr>
<tr>
<td><img src="image" alt="device_class" /></td>
<td>Device of protection class 3</td>
</tr>
<tr>
<td><img src="image" alt="ce" /></td>
<td>CE conformity mark. The device complies with the requirements of the Low Voltage Directive 2014/35/EU.</td>
</tr>
</tbody>
</table>
# Revisions of the user manual

<table>
<thead>
<tr>
<th>Revision</th>
<th>Revision date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0.0</td>
<td>05.12.2017</td>
<td>Software version 3.1.0.0</td>
</tr>
<tr>
<td>1.0.1</td>
<td>12.01.2018</td>
<td>Updated chapter “Equipment and accessories”</td>
</tr>
<tr>
<td>1.0.2</td>
<td>13.12.2018</td>
<td>Updated chapter “Symbols and signs”</td>
</tr>
<tr>
<td>1.1.0</td>
<td>18.06.2019</td>
<td>Updated chapter “Inspection and Maintenance” (former “Calibration of the system”)</td>
</tr>
<tr>
<td>1.1.1</td>
<td>20.11.2019</td>
<td>Updated chapter “Creating a measurement”</td>
</tr>
<tr>
<td>1.2.0</td>
<td>16.01.2020</td>
<td>Updated chapter “Inspection and Maintenance”</td>
</tr>
</tbody>
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