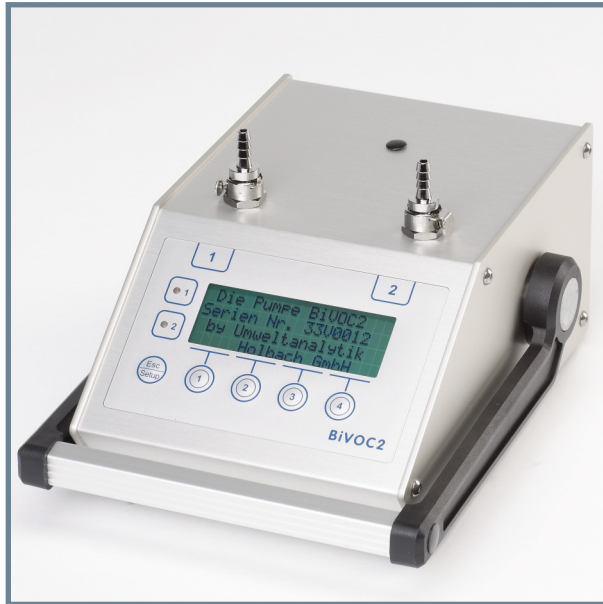

▶ 2-Channel Sampling Pump



BiVOC2

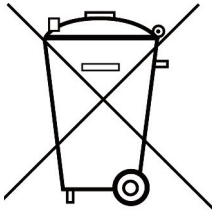
Operating Manual

Alt - Batterie Hinweis

In diesem Gerät befinden sich Batterien

1 Stück Lithium Knopfzelle Typ CR2032 für Energiepufferung der Echtzeituhr

1 Stück Industriebatterie (Akku) Typ LiPo 14,4 Volt für den Betrieb des Gerätes



Altbatterien (auch Akkus sind Batterien im Sinne des Batteriegesetzes) dürfen nicht in den Hausmüll.

Verbraucher sind verpflichtet, Batterien zu einer geeigneten Sammelstelle bei Handel oder Kommune zu bringen.

Die Batterien dieses Gerätes können nach Gebrauch auch bei uns abgegeben werden.

Altbatterien enthalten möglicherweise Schadstoffe oder Schwermetalle, die Umwelt und Gesundheit schaden können.

Batterien werden wiederverwertet, sie enthalten wichtige

Rohstoffe wie Eisen, Zink, Mangan oder Nickel. Das Symbol Mülltonne bedeutet: Batterien und Akkus dürfen nicht in den Hausmüll.

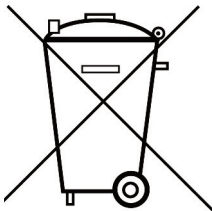
Die Batterien in diesem Gerät enthalten kein Blei, Cadmium oder Quecksilber.

Note: Old batteries

This device contains batteries

1 piece, Type CR2032 lithium button cell for energy buffering of the real-time clock.

1 piece, Type lithium polymer 14.4 Volt industrial battery (rechargeable) for the operation of the device.



Old batteries (rechargeable batteries are also batteries in terms of the Batteries Act) may not be disposed in household waste.

Consumers are obliged to take batteries to an appropriate collection point in the trade or local authority.

The batteries of this device may be returned to us after use.

Batteries may contain harmful substances or heavy metals that can harm the environment of personal health.

Batteries are recycled; they contain important raw materials such as iron, zinc, manganese or nickel.

The rubbish bin symbol stands for: batteries and rechargeable batteries may not be disposed of in household waste.

The batteries in this device do not contain lead, cadmium or mercury.

.....
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Note: This operating manual uses the following differing unit designations:

US-standard liters as SL, German-standard liters as Ls, Liters as L

This manual refers to program version 2.3.

Thank you very much for choosing our 2-channel sampling pump **BiVOC2!**

Please read this manual and the safety instructions carefully **before** using the device.

The **BiVOC2** is the 2-channel pump for simultaneous (double) sampling of gaseous and air-transported substances which deposit on sample media connected upstream of the **BiVOC2**.

The **BiVOC2** system is only for sampling in non-corrosive atmospheres.

Please note the safety instructions in section 14 of this manual.

This manual has to be provided to all persons operating the device and must be kept easily accessible.

The following pictograms are intended to help you reading this operation manual:



We recommended reading this paragraph very carefully.



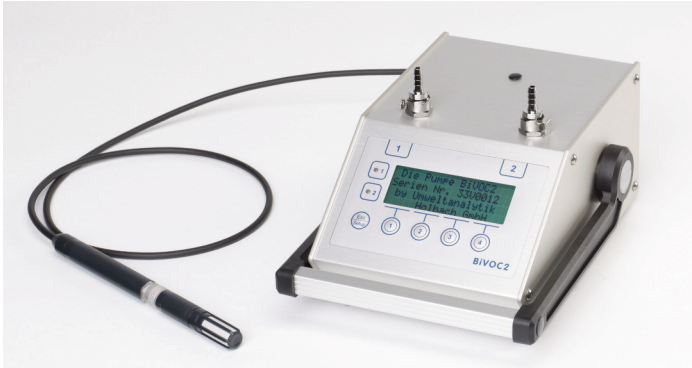
The actions listed in this paragraph are dangerous to persons and the device and are not permitted.



This paragraph describes troubleshooting and maintenance tasks.

The pictograms used are subject to the Creative Commons License; the author of the pictograms is the Regional Computing Centre of Erlangen (RRZE).

1. Package Contents



The delivery of the **BiVOC2** contains the following:

- ▶ the robust **BiVOC2** base device
- ▶ quick charger for operation with 100 - 240 V, 50 - 60 Hz
- ▶ this operating manual
- ▶ USB (A - B) cable for connection with a PC
- ▶ software BiVOC2.EXE for configuration, remote control and adjustment of the **BiVOC2** (on included data medium)
- ▶ a replacement 3A slow-blow fuse
- ▶ a hose nipple and an activated carbon cartridge (for plugging onto the air outlet to reduce operating noise)
- ▶ 1 m silicone hose, 4 mm inner Ø, 8 mm outer Ø
- ▶ Y-piece to combine the two inputs

And optionally:

- ▶ Temperature / humidity sensor, rotronic, Type HC2A-S
- ▶ Extension cable 1 m for Temperature / Humidity sensor
- ▶ Sample-media bracket
- ▶ Handling case

2. Control Element and Connector Positions

2

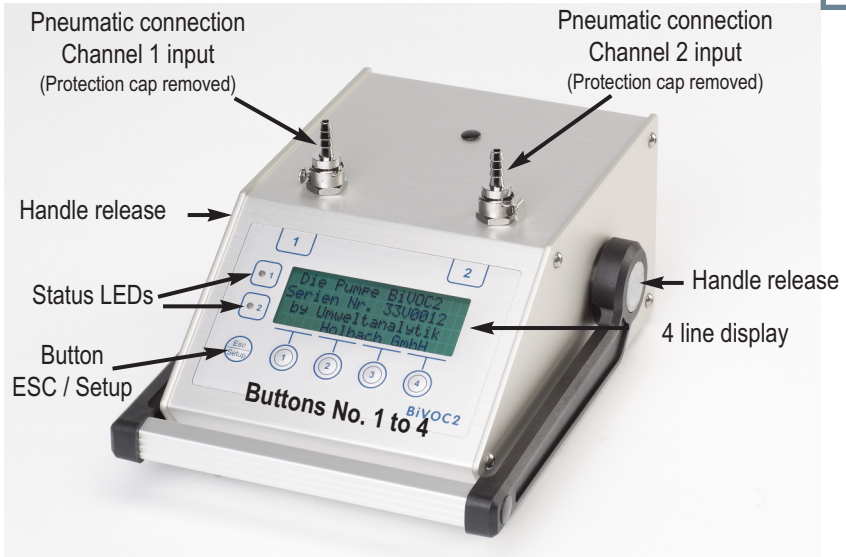


Figure 1 **BiVOC2** front view

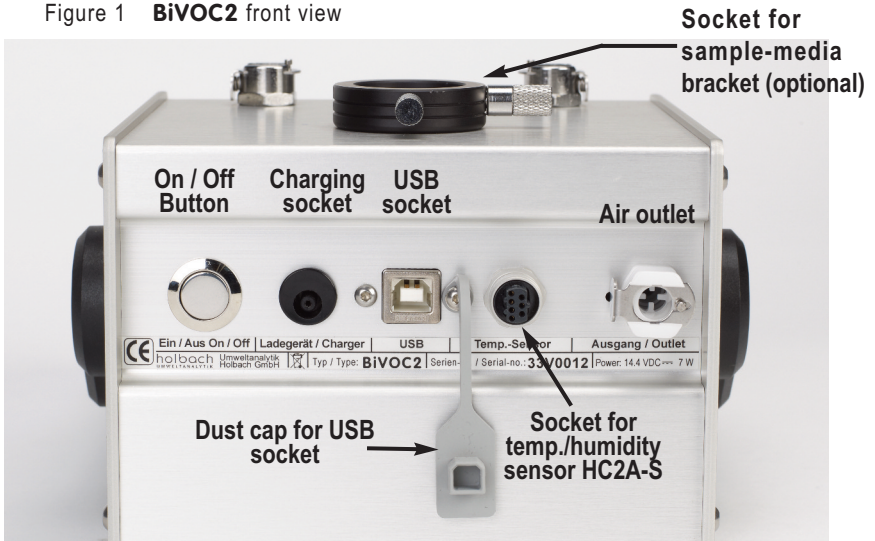


Figure 2 **BiVOC2** rear view

3. Connections

3

3.1 Pneumatic Connections

The connections for the **sample-air inlets** are on the top of the **BiVOC2** with pluggable hose nipples made of metal for hoses with 4 mm inner diameter.

The hose nipples are plugged into self-locking metal couplings.

Info: The couplings for the sample-air inlets are equipped with valves. If no hose nipple is plugged in the connection is closed.

There is a protection cap on the hose nipples that needs to be removed before use.

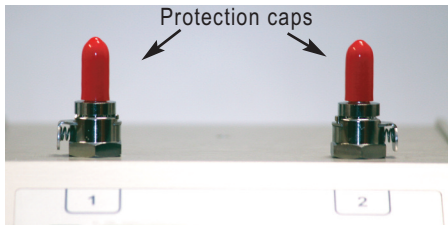


Figure 3 Protection caps on the hose nipples

The **sample-air outlet** is equipped with a self-locking coupling made out of plastic and is on the rear side (see figure 2).

The coupling in the sample-air outlet has no valve and is always open. Delivery includes a pre-assembled hose nipple with a short hose piece and an activated carbon cartridge. One side of the activated carbon cartridge is to be put into the end of the hose. The hose nipple with the connected cartridge is to be fitted into the sample-air outlet and is used as a sound suppressor.



The size of the pluggable coupling in the air inlets and air outlets is the same.

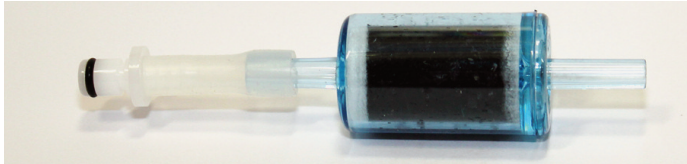


Figure 4 Hose nipple with filter cartridge as sound suppressor

Removing the hose nipples:

To remove the plug first press on the latch (1) and then pull off the hose nipple (2).

Connecting the hose nipples:

To connect the hose nipple first press the latch (1) until it locks into position. Then insert the hose nipple (2) into the coupling until it locks into position.

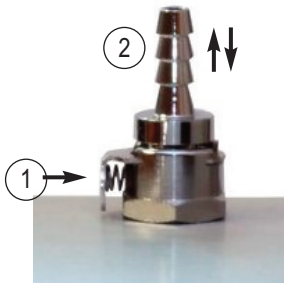


Figure 5 Inlet connection

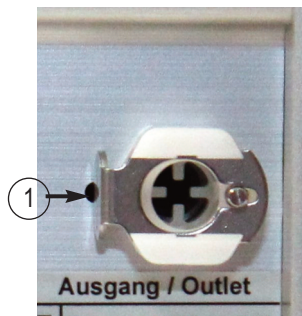


Figure 6 Outlet connection

3.2 Electrical Connections

3

3.2.1 Battery Charger Socket

Connect the charger plug of the delivered quick charger into the round battery charger socket (low voltage plug EIAJ5).

Only use the charger that came with the delivery for charging. Using any other charger can damage the electronics, the integrated rechargeable battery and the charger itself.



Polarity: Inner pin is “positive 14.4 volts” outer wall “ground”.

3.2.2 USB Socket

Use the USB interface along with the PC program BiVOC2.EXE and the USB connecting cable (type A-B) to load the stored sampling data and to make changes to the adjustment values.

The USB interface has a cap to keep it free of dust.

3.2.3 Temperature and Humidity Sensor Socket

The **BiVOC2** features a socket for the temperature and humidity sensor HC2A-S by rotronic. The temperature and humidity readings are read digitally. An optional extension cable can be connected between the sensor and the **BiVOC2**. The temperature value is used for converting US-standard liters to volumetric liters. Apart from that, the average readings of the connected sensor are stored as average readings in the sampling history.

3. Connections

As the socket contacts are asymmetrical, the temperature and humidity sensor HC2A-S only fits in one position into the socket. The sensor is secured with the sleeve nut.

3

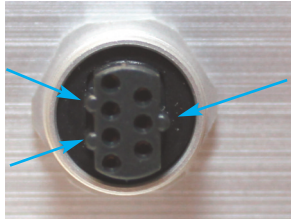


Figure 7 The socket for the temp./humidity sensor

The length of the HC2A-S sensor is approx. 10.8 cm.



Figure 8 The temp./humidity sensor rotronic HC2A-S

3.3 Mechanical Connections

3

3.3.1 Tripod Sockets

There are two tripod sockets in the **BiVOC2** device base: UNC 1/4 inch (photo) and UNC 3/8 inch (microphone).

Only use tripods that can support the weight of the **BiVOC2** (approx. 3 kg) and ensure that they also provide a secure standing.

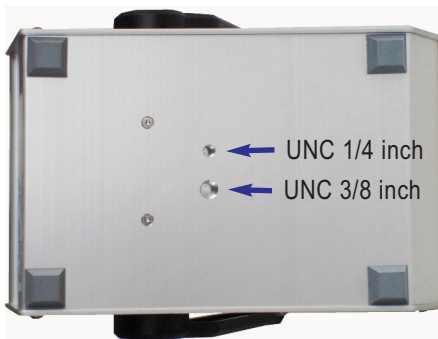


Figure 9 Tripod sockets in the device base

4. Sample-Media Bracket

4

4. The Optional Sample-Media Bracket

The optional media bracket can be used to fix the sample-media approx. 25 cm above the pump.

It is fixed by using a clamp. The gooseneck allows the clamp to be tilted. The media bracket can be turned through 360 ° when in the socket.

The media bracket can be removed from the socket on the top side of the pump for transport.

Installation:

- insert the media bracket into socket
- if necessary fix, with the fixing screw (1) as shown in figure 10.

If the media holder cannot be inserted into the socket, the fixing screw (1) in figure 10 may need to be released slightly.

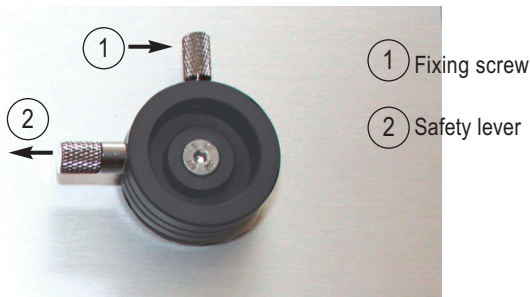


Figure 10 Media holder socket on the top side of the device

Removing:

- release the fixing screw (1) as shown in figure 10.
- unlock by pulling the safety lever (2) as shown in figure 10 and at the same time lift the media holder upwards.

4. Sample-Media Bracket



← Press the clamp together here to open

4

The media bracket is not for gripping!

The media bracket quick release plate is not designed to be pulled on. Therefore never pull the **BiVOC2** pump with the media bracket.



Figure 11 Media bracket

5. Control Elements and Indicators

5. Control Elements and Indicators

5.1 On / Off Button

Quickly press the button on the rear side of the device (figure 2) twice to switch-on the **BiVOC2**.

5

When starting the two status LEDs illuminate briefly, you hear a beep and the serial number and, if present, the factory-generated personalized text is shown on the display for 4 seconds.

Pressing the button for more than 0.2 seconds switches-off the **BiVOC2**

If the button is pressed for more than 12 seconds the **BiVOC2** micro-controller is reset (Master reset).

5.2 Display and Control Buttons

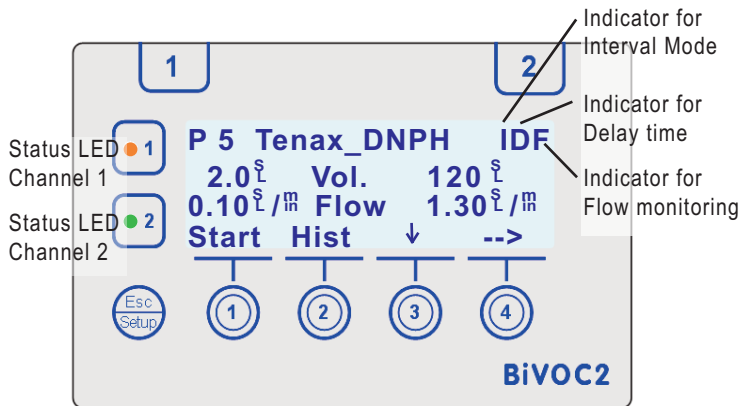


Figure 12 Home screen after power-on (Example)

The display has 4 lines, each with 20 characters and features an adjustable background illumination.

The bottom line shows (with exceptions) the corresponding function of the buttons no. 1 - 4 located just below.

5. Control Elements and Indicators

The display of channel-specific data is column-oriented:

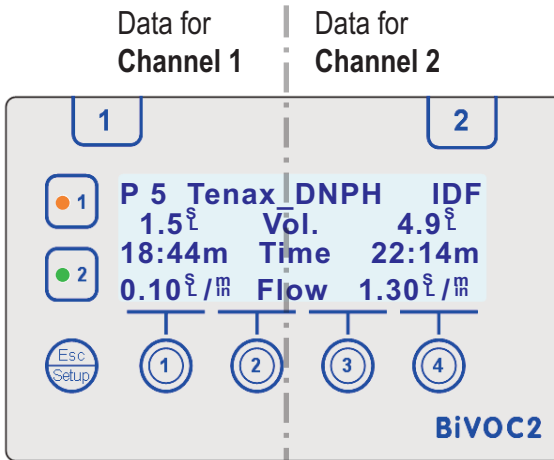


Figure 13 Column-oriented representation of channel-specific data

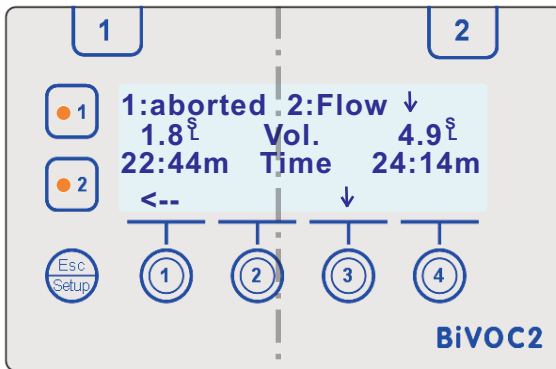


Figure 14 Status display after sampling

The symbol L means US-Standard Liters, the symbol LS means German-Standard Liters, the symbol m means minute.

5. Control Elements and Indicators

5.3 Esc/Setup Button Functions

The function of the Esc/Setup button always depends on the operational mode of the **BiVOC2**. There is a difference between a short press and a long press (more than 3 seconds).

5

Button	Function
ESC long press	Start, end of the special functions: Information, device settings and service functions
ESC short press	in the home screen and during sampling: Battery state and free log data memory, temperature, humidity and air pressure in the settings menu, history, editing mode: go to parent menu, abort.

Table 1 Function of the button **Esc/Setup**

5.4 Function Buttons

Button	Function
↓, ↑	For vertical positioning in lists such as pre-settings, history data (sampling results from previous samplings) Example: Next parameter of the current program preset
<-- -->	For horizontal scrolling through lists such as pre-settings and history data. Example: Current pre-setting program is program no. 5. After pressing --> the data of program no. 6 is shown and preset.

Table 2 Function of the function buttons

5. Control Elements and Indicators

5.4 Function Buttons (continued)

Button	Function
Start	starts the sampling if the check before the start was successful
Hist	opens the history list to display the 64 latest samplings
Edit	starts the editing mode Important: changes are only accepted as valid after the Save button is pressed
STOP	aborts the sampling of both channels after a confirmation prompt
Set.	shows the presets (target values) during the sampling
ok	ends the current display, aborts the function. Important: Changes are not saved
Save	saves the preset data with the current program number
Cha1 Cha2	for channel selection during sampling and when editing
-/--	decrease / change the current parameter. Short-press changes the value by one unit, long-press causes a fast change
+/**	increase / change the current parameter. Short-press changes the value by one unit, long-press causes a fast change
New	for starting a sampling on a channel that is idle while the other channel is still active.

5

Continuation of table 2 Function of the function buttons

5. Control Elements and Indicators

5.5 Status LEDs

The sampling status of each channel is shown with a three-color LED.

Color	Illuminated / flashing	Meaning
orange	flashing	Sampling started, delay time is counting down or the channel is paused
orange	illuminated	Sampling in progress
green / orange	flashing	Sampling manually aborted
red	illuminated	An error occurred during sampling (e.g. battery low)
red / orange	flashing	The flow monitoring indicates that the flow is below or exceeds its limits
red	flashing	The channel is faulty (adjustment data incorrect or the flow stream sensor issues an implausible signal)
red / green	flashing	The channel is selected in editing mode During sampling: Channel is in a pause between 2 intervals
red	Channel 1 and 2 flashing alternately	The check before the start indicated an error (e.g. insufficient free log data records, the battery charge may be too low)
red	Channel 1 and 2 illuminated	A device error occurred

5

Table 3 Status LEDs

5. Control Elements and Indicators

5.6 Audible Signals

An internal audible signal indicates an event (sampling finished, alarm) and gives an audible button acknowledgement.

5

Audible signals can be activated or deactivated in the device settings:

- ▶ short sound to acknowledge a button press
- ▶ sounds in intervals at the end of sampling
- ▶ steady sound to indicate an alarm, remains until acknowledged

6. Pre-Settings

6.1 Pre-Setting Data

The pre-settings for both channels are stored in the **BiVOC2** as program.

A name can be assigned to every program (up to 10 characters, changed with the PC program BiVOC2.EXE).

6

The following data can be defined for every channel:

- ▶ Volume in SL (US-standard liters), Ls (German-standard liters) and with optional temp./humidity sensor also L (volumetric liters)
- ▶ Volume flow in SL/min, Ls/min or L/min
- ▶ Sampling duration (can only be edited in interval mode)
- ▶ Starting delay time for delayed or deferred sampling
- ▶ Interval mode per channel
- ▶ Volume flow monitoring (used for both channels)
- ▶ Volume type as SL, Ls and with optional temp./humidity sensor also L (used for both channels)

Note: Information on the individual volume types can be found in Appendix A.

6.2 Selecting the Pre-Settings

After switching-on and after the opening screen and battery state is shown the home screen (figure 12) is displayed. The pre-settings of the latest sampling are then selected.

Up to 10 programs (presets) can be defined. The number of programs displayed can be limited in the device settings. Program selection is done by pressing button no. 4 (-->).

6.3 Editing the Pre-Settings

To change the pre-settings the program must be selected on the home screen. The first sub-level has to be selected using button no. 3 (↓). Pressing button no. 2 (**Edit**) enters editing mode.

6. Pre-Settings

6.3 Editing the Pre-Settings (continued)

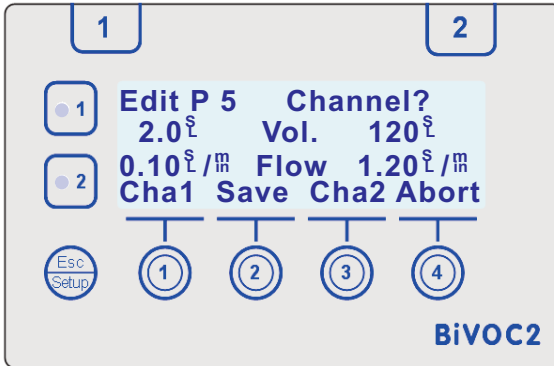
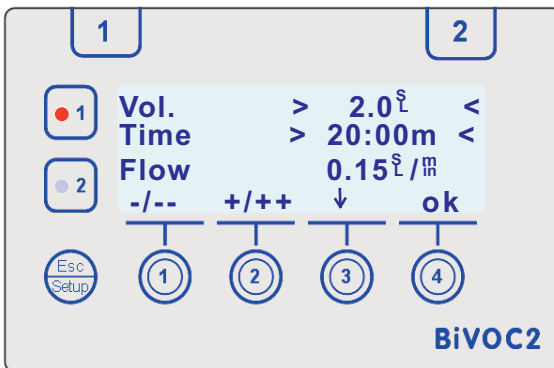


Figure 15 Editing mode selection of the channel to be edited

At any one time data can be only changed for one channel. Button no. 1 selects channel 1 and button no. 3 selects channel 2 for editing.

Button no. 4 (**Abort**) ends the editing mode **without saving** the changed data.

Button no. 2 (**Save**) stores the program (**with changes**).



The marks > < indicate the parameter that is currently being changed (Cursor).

Button no. 3 (↓) selects the next parameter.

Figure 16 Editing mode is active

6.3 Editing the Pre-Settings (continued)

Note: In the following, SL is specified as the volume type. Depending on the selected volume type it can also be Ls or L.

The **volume** is changed in volume-dependent steps:

from 0 to 3 SL in steps of	0.5 SL.
from 4 to 50 SL in steps of	1 SL.
from 50 to 1000 SL in steps of	10 SL.
from 1000 to 5000 SL in steps of	100 SL.

6

When set to 0 SL, this channel is deactivated during sampling and its status is shown as “ready”.

The maximum volume is 5000 SL. However, the sampling time may not exceed 999 hours.

The **time** (sampling duration) is calculated from the values of volume and volume flow. In interval mode (Section 7.4) it is possible to change the sampling duration independently. Depending on the duration the time is represented in hours and minutes (**01:33h**) or in minutes and seconds (**40:13m**). The format change is done automatically.

The **volume flow** can be set from 0 to 1.9 SL/min. Up to 0.2 SL/min the changes are done in 0.05 SL/min steps, beyond that in 0.1 SL/min steps. When set to 0 SL/min this channel is deactivated during sampling and its status is shown as “ready”.

As to whether the selected volume flow is reached depends on the necessary pressure difference (flow resistance) of the sample-medium and on the number of active channels.

The starting **delay time** can be set in the range from 0 seconds to 24 hours. If less than 1 minute, the step size is 10 seconds, above 30 minutes the step size is 10 minutes.

If the delay time is set, a **D** is shown in the upper line in column 19 of the home screen.

6.3 Editing the Pre-Settings (continued)

Interval mode (Section 7.4) can be activated for each channel. It allows to extend the sampling duration for combined samplings without overloading the sample medium. If the interval mode is active for at least one channel, an **I** is shown on the upper line in column 18 of the home screen.

6

The following parameters are valid for both channels:

If the **flow monitoring** is enabled, the volume flow must be inside the tolerance range within 30 seconds after the sampling started.

The tolerance range depends on the volume and is

- up to 0.2 SL/min: $\pm 30\%$ of the target volume flow
- up to 0.6 SL/min: $\pm 20\%$ of the target volume flow
- up to 1.9 SL/min: $\pm 10\%$ of the target volume flow.



If the reading is below or exceeds the limits for more than 30 seconds, a flag is set in the sampling data and **Flow ↓** is shown in the display.

If the flow monitoring is enabled, an **F** is shown in the upper line in column 20 of the home screen.

Please note that the end of the sampling is determined by the **target volume**. If the target volume flow is not reached, more time is required for the sampling.

The **volume type** can be selected between SL (US-standard liters) and Ls (German-standard liters). The conversion takes place internally.

By using the temperature/humidity sensor the additional **volume type** volumetric liters can be selected.

The setting of the volume type is valid for both channels.

Note: Information on the individual volume types can be found in Appendix A.

7. Sampling

7.1 Preparing the Sampling

The following list is only an example and can be different depending on the task and the sample-media used:

- ▶ set the pump **BiVOC2** up at the sampling location
- ▶ install the media bracket, if necessary
- ▶ insert the sound suppressor into the air outlet, if necessary
- ▶ plug the temperature sensor (with extension cable) in, if necessary
- ▶ switch-on the **BiVOC2**
- ▶ check if the battery capacity is sufficient - connect the charger, if necessary
- ▶ select the program with the pre-settings and edit, if necessary
- ▶ prepare and connect the sample-media for the sampling
- ▶ start the sampling

7

7.2 Starting the Sampling

The sampling is started with button no. 1 (**Start**). After 4 seconds the current volume flow for active channels is shown in the bottom line.

The following is checked before the sampling starts:

- ▶ whether the measured flow on both sensors is zero
- ▶ whether the current battery capacity is sufficient (this check can be deactivated in the settings)
- ▶ whether there is sufficient space in the log memory, if data logging is enabled (progress of the sampling is recorded)
- ▶ whether the temperature sensor is connected, if volume type liter is selected

If the check fails, the user can abort the starting process or, depending on the message, change the parameters or just ignore the warning and start the sampling.

7. Sampling

7

7.3 Functions during Sampling

During sampling pressing the **Esc** button will show the battery level, the amount of free log data records as well as the current air pressure. If the temperature/humidity sensor is connected, the respective values are shown, too.

If the volume flow is shown in the fourth line, pressing one of the buttons no. 1 - 4 will show the other possible functions for 4 seconds:

Button no. 2 (**Set.**) shows the presets for the current sampling.
 Button no. 3 (**STOP**) stops the sampling after a confirmation prompt.
 Buttons no. 1 (**Cha1**) and no. 4 (**Cha2**) show the channel-specific functions:

- ▶ Start during the delay time or pause
- ▶ Pause the current sampling
- ▶ Abort the sampling on the selected channel
- ▶ Start a new sampling (**New**)

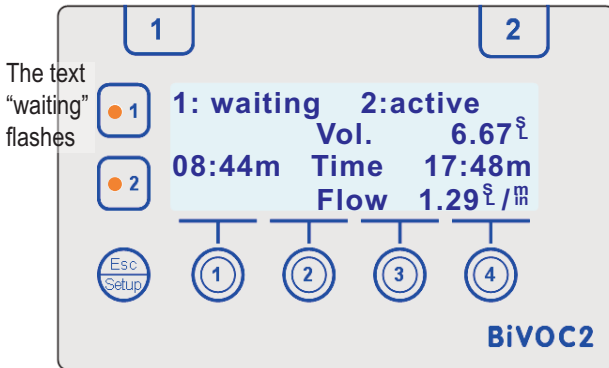


Figure 17 Sampling in progress (Chan. 1 is waiting, Chan. 2 is active)

The end of the sampling is signalled with the status LEDs and an audible signal.

7. Sampling

During sampling the following information is constantly being shown for each channel:

- ▶ Status (**active**, **waiting**, **pause**, **abort**, **Flow** ↓)
- ▶ the volume drawn
- ▶ the remaining sampling time or delay/pause time
- ▶ the currently measured volume flow or the special functions

7

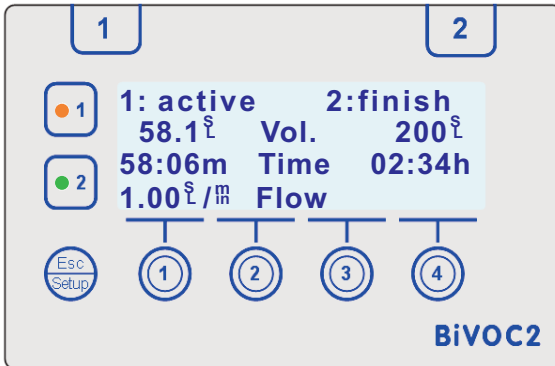


Figure 18 Sampling in progress (Chan. 1 is active, Chan. 2 is finished)

During the sampling the pump control loop regulates the pump to the most energy efficient operating point. This readjustment is done in small steps and can take several minutes.

Note for sampling using only one channel: ideally the volume should be set to 0 in the pre-settings for the channel not being used.

Alternatively, the channel not being used can run “empty”. If this is the case, a hose nipple has to be inserted into the pluggable coupling. Since this input is otherwise closed, the regulation in the **BiVOC2** would upregulate the pump (unnecessarily) due to the lack of volume flow.



7.3 Interval mode

Note: 2 time specifications with different meanings are used:

Sampling time is the time in which the channel is active and when air is drawn through the sample medium.

Sampling duration is the complete time between sampling start and end (including pauses).

If not in interval mode, sampling time and sampling duration are identical unless manual pauses were done.



7

In interval mode the sampling duration of a channel will be extended to a preset time. This can be used to match the duration of a shorter sampling to that of a longer one such that both will be finished at the same time.

In this mode **BiVOC2** automatically switches between sampling and pause in certain intervals such that the target volume will be reached when the preset duration is over. The **maximum number** of intervals can be configured in the settings (Section 11.14). The actual number as well as the duration of each interval and pause are calculated automatically and cannot be influenced.

The calculations take these limit values into account:

Minimum run time per interval: **10 minutes**

Minimum pause time: **5 minutes**

Minimum number of intervals: **2**

Maximum sampling duration: **1000 hours**

From this it follows that the sampling time may not be below **20 minutes** (2 intervals of 10 minutes each).

Accordingly, the minimum sampling duration is **25 minutes** (2 intervals of 10 minutes each + 1 pause of 5 minutes).

If the sampling time for the set volume and the set volume flow is too short, the interval mode cannot be activated.

7. Sampling

7.3 Interval mode (continued)

Additionally, when editing a channel, it will be prohibited that the sampling duration, the volume and the volume flow are set such that the limit values could not be met.



7

This possibly leads to the case that incrementing or decrementing of these parameters does not work without obvious reasons and an acoustic signal is emitted instead. In that case it is recommended to deactivate the interval mode and to set the volume and the volume flow to the desired values. Afterwards, the interval mode can be activated again and the duration can be set.

If a channel is inactive because volume or volume flow are set to 0, the other two parameters can be set freely. Upon activation of the channel (by incrementing the parameter that was set to 0) a suitable value for that parameter will be calculated and set instead of the smallest possible one. This ensures that the limit values are always met.

For a channel in interval mode the complete remaining duration is shown as "Time" during sampling. During a pause between two intervals the remaining pause time is shown.

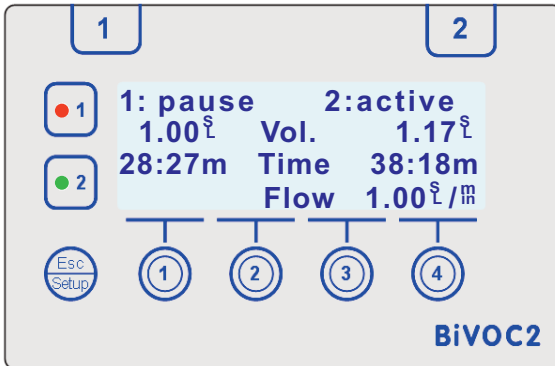


Figure 19 Sampling in progress (Chan. 1 in interval pause, Chan. 2 is active)

7.3 Interval mode (continued)

It is possible to continue from an automatic pause like from a manual pause. The times of the following intervals and pauses will be recalculated.

Manual pauses are possible but also have to be continued manually. In this case the times are will be recalculated, too. If the (manual) pause lasted so long that it is no longer possible to complete the remaining intervals in the given sampling duration, the rest of the volume will be drawn in one interval.

It is possible that the preset sampling duration cannot be maintained correctly anymore in this case.



7.5 (Re)Starting a Channel during a Sampling

A channel that is finished or inactive can be restarted **while** the other channel is still active or is waiting for the delay time.

In the following example channel 1 is still active and channel 2 is already finished.

Press any button and then press button no. 4 (**Cha2**) to show the functions for channel 2.

7

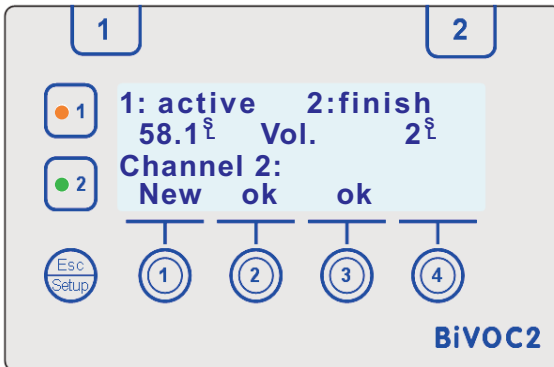


Figure 20 (Re)starting a channel, channel 2 in this case

When pressing button no. 1 (**New**), the selection of the pre-settings is shown (Figure 21). You can return with the button **Esc** or buttons no. 2 and 3 (**ok**).

Button no. 3 (**↓**) shows the remaining pre-setting parameters.

Button no. 4 (**-->**) selects the next program.

The sampling is started on this channel with button no. 1 (**Start**).

7.5 (Re)Starting a Channel during a Sampling (continued)

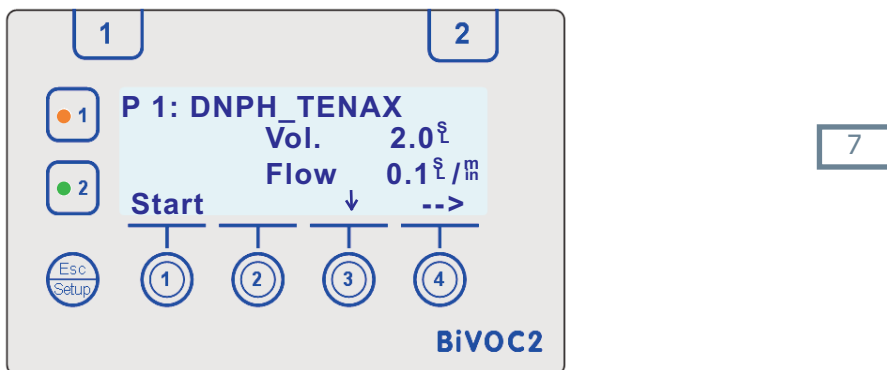


Figure 21 (Re)starting a channel, Selection of the pre-settings

Notes:

It is possible that the channels use different volume types when started using this mode.

When (re)starting a channel it is not possible to edit the selected pre-settings.



8. History

After sampling is finished and there is no alarm, the historical data of this sampling is shown.

The data for the last 64 samplings is kept for display in a ring buffer. Each sampling is assigned a consecutive number from 0 - 65535.

The historical data contains:

For each channel:

- ▶ Status of the sampling (completed, aborted, alarm)
- ▶ Sampling volume (actual value)
- ▶ Sampling duration (actual value)
- ▶ Sampling point in time (date and time)
- ▶ Sampling volume (target value)
- ▶ Volume flow (target value)
- ▶ Duration (target value, or --- when not in interval mode)
- ▶ Volume type SL / Ls / L (displayed as unit for volume)
- ▶ Temperature as arithmetic average (from minute intervals)
- ▶ Humidity as arithmetic average (from minute intervals)
- ▶ Air pressure as arithmetic average (from minute intervals)

8

The status of the sampling is also signalled with the status LEDs.

The history display is quit with the **Esc** button.

The historical data can be deleted in the device settings.

9. Special Functions Menu

In **BiVOC2** the following special functions are available in addition to sampling:

- ▶ Information: shows device information
- ▶ Settings: for configuring the **BiVOC2**
- ▶ Service functions: Tests, adjustments, display of internal signals

The menu with the special functions is activated by long-pressing the button **Esc/Setup** in the home screen (Figure 12).

9

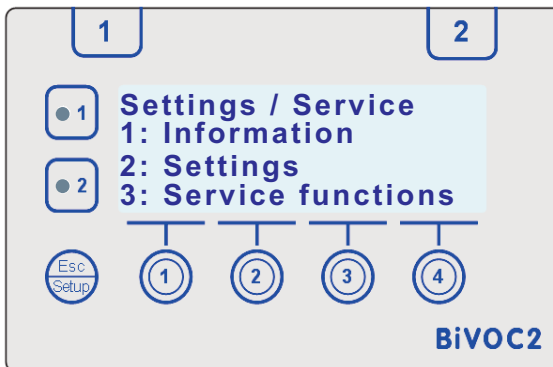


Figure 22 Entry menu for special functions

The desired function is activated by pressing the button with the corresponding number.

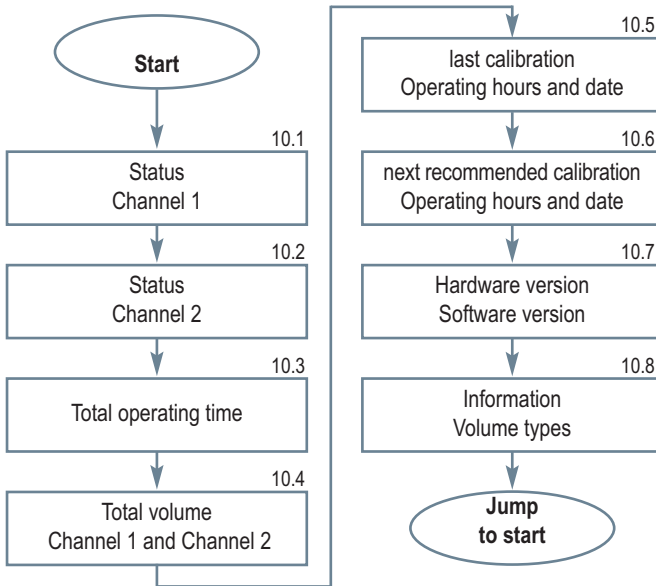
When no special function is selected within 10 seconds after the special function menu is shown, **BiVOC2** will switch back to the home screen. The special function menu can be quit by pressing the button **Esc/Setup**.

10. Information

Use the function buttons to navigate as shown in table 2.

The special function “Information” is quit by pressing the button **Esc/Setup**. A short press returns you to the special functions menu (figure 22), a long press returns you to the home screen (figure 12).

Listing of information



10

10.1 / 10.2 Channel Status

Channel-specific errors are shown. Line 2 shows the status of the channel adjustment data. A redundant copy of the channel-specific adjustment data is stored in memory. If this is lost, no volume flow can be calculated and sampling using this channel is not possible. Line 3 shows the analog raw value of the flow stream sensor (180 - 220).

10.3 Total Operating Time

The operating hours of the pump are shown.

10.4 Total Volume

The sampling volume of each channel is shown.

10.5 Last Calibration

The operating hours and the date of the last calibration are shown.

10.6 Next Calibration

The operating hours and the recommended date for the next calibration are shown. The first event to be reached determines when the calibration should take place.

10.7 Hardware / Software Version

The hardware version (HW) and the software version (SW) are shown.

10.8 Volume Types Used

The volume types with reference to temperature and pressure are shown with the corresponding symbol.

11. Settings

11. Settings (Configuration)

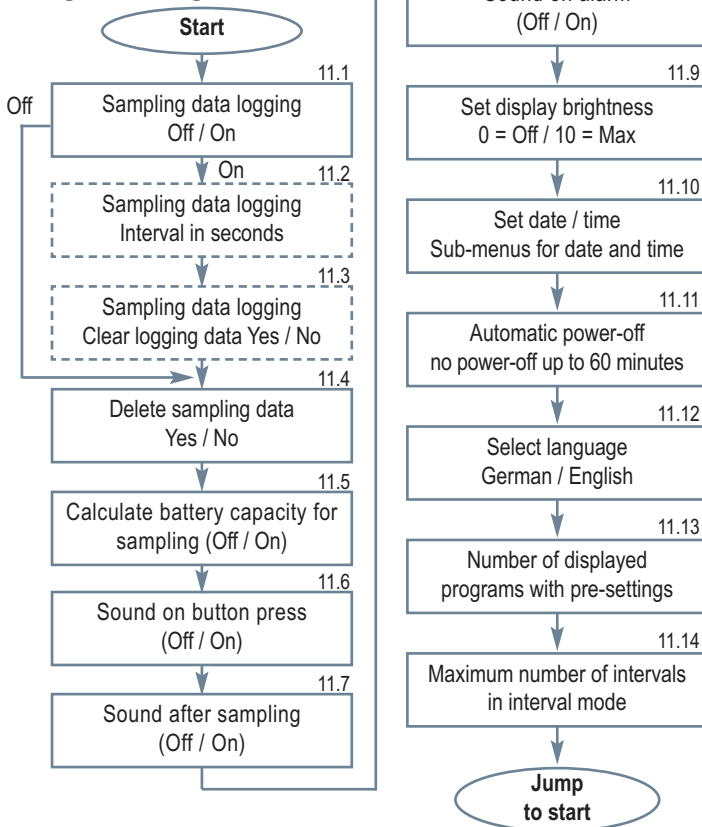
To navigate and change the settings use the function buttons as shown in table 2 on page 14.

The button **Esc/Setup** is used to quit the special function "Settings". A short press returns you to the special functions menu (picture 22), a long press returns you to the home screen (picture 12).

Changes are immediately effective (except date and time).



Listing of settings



11

11.1 Data Logging Off / On

The recording of the sampling process can be switched on / off here.

BiVOC2 will record the sampling process in preset intervals. Records contain:

- ▶ Date and time
- ▶ Volume flow channel 1
- ▶ Volume flow channel 2
- ▶ Status of the flow monitoring channel 1
- ▶ Status of the flow monitoring channel 2
- ▶ Temperature (only with connected sensor)
- ▶ Humidity (only with connected sensor)
- ▶ Air pressure

The data can be transferred directly to an EXCEL spreadsheet with the program BiVOC2.EXE.

11

11.2 Data Logging Interval Time

The log interval for recording the sampling process can be set in the range 1 to 240 seconds (4 minutes).

11.3 Clear Data Log

There are 3840* memory locations available for logging. If the indicated amount of memory locations is not sufficient for the sampling, used memory can be deleted after a confirmation prompt. If that data has not been transferred using the program BiVOC2.EXE before deleting, the information is lost.

11.4 Clear Sampling Data

The pre-settings and results of the latest 64 samplings are stored in a ring buffer. This memory can be deleted. This causes the sequential number for the sampling to be reset to zero. A confirmation prompt should prevent inadvertent deletion of the data. If that data is not transferred using the program BiVOC2.EXE before deleting, the information is lost.

* depending on the hardware version the number of memory locations may be 1792

11.5 Calculate Battery Capacity for Sampling

BiVOC2 calculates from the pre-settings, the number of active channels and the battery voltage (~ remaining capacity) if the battery capacity is sufficient for the sampling. If this calculation is enabled, pressing the start button will cause a warning to be issued if the expected capacity is too low.

The calculation constants were determined empirically. Battery aging and other influences can distort the results.



11.6 Sound on Key Press

BiVOC2 can acknowledge every button press with a short audible signal of 0.1 second. If the audible signal is enabled, the **BiVOC2** confirms the switch-off process with two audible signals.

11

11.7 Sound after Sampling

The audible signalling at the completion of sampling can be switched on and off here.

11.8 Sound on Alarm

The audible signalling (continuous sound) of an alarm event can be switched on and off here.

11.9 Set Display Brightness

The LC display is illuminated to allow the use of **BiVOC2** in dark environments. Brightness settings from 0 (off) to 10 (max. brightness) can be selected.

11.10 Set Date and Time

Button no. 2 opens the setup menu for the date and button no. 3 opens the setup menu for the time. The set data is accepted by pressing button no. 4 (**Set**). The sub-menus are quit with the **Esc/Setup** button.



11.11 Automatic Power-Off

BiVOC2 can be configured to shut down automatically if no operation is performed for a preset time.

Possible combinations are:

- ▶ No power-off (manual shut-down only)
- ▶ 10 minutes without any button press and 30 minutes with messages
- ▶ 30 minutes without any button press and 60 minutes with messages
- ▶ 60 minutes without any button press and 60 minutes with messages

Messages are about a finished sampling and alarms such as aborted samplings etc.

Even when set to "No power-off" the **BiVOC2** shuts down automatically after one minute if the battery is discharged.



11

11.12 Select Language

English and German are available.

11.13 Number of Displayed Programs

The selection of the program with the pre-settings is done with button no. 4. To hide programs that are not required the number of shown programs can be limited (starting with 1).

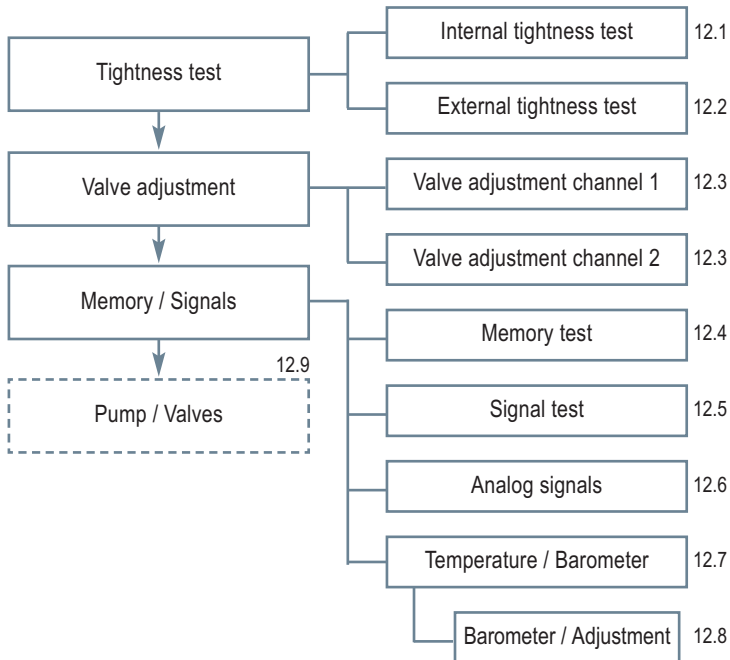
11.14 Maximum Number of Intervals

The maximum number of intervals that should be done in interval mode can be set between 2 and 50.

12. Service Functions

12. Service Functions

For maintenance and service corresponding functions are implemented in **BiVOC2**. Pressing the button with the number in front of the test name opens the corresponding sub-menu / test menu.



12.1 Internal Tightness Test

The internal tightness test checks the tightness of the internal control valves, the pressure storage and pump. After pressing button no. 2 (**Start**) it is first checked whether the inlets are open.



12. Service Functions

Then, the control valves are closed and a vacuum in the pressure storage is created. Once the vacuum has been reached, the flow sensor is checked for flow for a period of 60 seconds. The permitted limit is 1.5 mSL. If this limit is exceeded, adjusting the valve of the corresponding channel as described in section 12.3 can improve the result. The test can be aborted by pressing button no. 3 (**STOP**).

12.2 External Tightness Test

The external tightness test checks the tightness of the internal pneumatic components and the components connected to the sample-air inlets. After pressing button no. 2 (**Start**) a vacuum is created. Thereafter the pump is switched off and the pressure difference is checked after 60 seconds. The limit value is 5% of the starting pressure. The test can be aborted by pressing button no. 3 (**STOP**).



12.3 Valve Adjustment

The actuating device travel distance for the control valves is larger than the required effective travel distance. The adjustment re-determines the point of actuation for the open and closed positions. Make sure that the air inlets are **open** by checking that hose nipples are inserted into the pluggable couplings before starting.

The test can be aborted by pressing button no. 3 (**STOP**).

The new points of actuation can be accepted by pressing button no. 2 (**Save**).



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12. Service Functions

12.4 Memory Test

This test checks whether the memory where the sampling data and the log data is stored can actually be written to and read from. The result is additionally signalled optically with the status LEDs.

**12.5 Signals**

The status LEDs and the audible signal emitter are activated subsequently. The corresponding action is shown in the display. This screen is quit by pressing any button.

**12.6 Analog Signals**

The input values of the internal analog inputs are shown. This screen is quit by pressing any button.

12.7 Temperature / Barometer

The values and the serial number of the connected temperature and humidity sensor are shown. In column 20 of line 3 the status of the transfer is shown (1 = received OK, 2 = checksum of the received data is incorrect, 3 = not enough data received, 4 = no data received). If no or too little data is received, the character ? is shown instead of the measured value.

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12.8 Barometer

This function is called via buttons no. 1 or no. 2 from the function "Temperature / Barometer" in section 12.7. The measured value and the raw value of the barometric sensor are shown. Button no. 3 (**Adj.**) starts the sub-function for adjustment of the barometric sensor. Use buttons no. 1 (**-/--**) and no. 2 (**+ /++**) to set the real pressure and button no. 3 (**Set**) to accept the value as valid.

**12.9 Pump / Valves**

This function is only intended for service operations and not described here any further.



13. Charger

A quick charger for charging the integrated LiPo-battery pack (14.4 Volt / 3800 mAh) is part of the delivery.



Figure 23 The Quick charger for **BiVOC2**

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The charger can be operated with a voltage of 100 - 240 volts and a mains frequency of 50 - 60 Hz.

13.1 Using the Charger

Insert the power plug into a mains socket.

After connecting to the mains supply the LED lights up in green.

Insert the plug of the quick charger into the charger socket of **BiVOC2**.

The state of the charger is indicated with a multi-colored LED.

Orange: Quick charging until about 80 - 95% charged.

Yellow: Final charge until 100% completed.

Green: The battery is fully charged or the charger plug is not connected.

With a completely discharged battery charging to full can take up to 5 hours; 80% is reached after about 2 hours.

14. Safety Instructions

14. Safety Instructions

Non-compliance with these safety instructions may lead to damages of the device and even to dangerous personal injury!

- ▶ The **BiVOC2** may only be used for the intended purpose!
- ▶ Never block the air outlet when the pump is running!
- ▶ **BiVOC2** may only be used by qualified personnel!
- ▶ Prevent fluids from entering the **BiVOC2** and the charger!
- ▶ Keep the **BiVOC2** and the charger away from children!
- ▶ Avoid touching the membrane keypad with sharp or pointed objects!
- ▶ Do not insert any inappropriate objects into the pneumatic and electrical connections!
- ▶ Do not use in areas with danger of explosion!
- ▶ Use the charger only in dry indoor areas!
- ▶ Do not use defective connection cables!
- ▶ Do not cover the charger during operation!
- ▶ Use the charger only to charge the integrated LiPo battery!
- ▶ Do not use the optional media bracket as handle!
- ▶ Observe the usage instructions and notes from the sample-media manufacturer / supplier!



14



15. Cleaning and Maintenance Instructions

15. Cleaning and Maintenance Instructions

Clean the **BiVOC2** with a damp and lint-free cloth.

Do not use abrasives.

Do not exert pressure on the display window in the membrane keypad.

Do not insert any inappropriate objects into the pneumatic and electrical connections.



15.1 Calibration and Maintenance Interval

The recommended calibration and maintenance interval is at every 300 operating hours of the integrated pump - however, at least every 2 years.



Note:

When not in use charge the battery pack of the **BiVOC2** at least every 12 months with the included battery charger.



16. Technical Data

16. Technical Data

Number of channels:	2 individually controlled channels, one mass flow sensor for each channel
Volume flow:	0.1 to max. 1.9 SL/min per channel, dependent on the necessary negative pressure
Sample-air volume:	1 to 5,000 SL, Ls or l
Volume types:	US-standard liters (SL) German-standard liters (Ls) Volumetric liter (L or l) with temperature sensor
Start delay:	5 seconds up to 24 hours
Data storage:	64 sampling data (Ring buffer), 3480 records for sampling log
Pre-Settings:	up to 10 pre-settings (Volume, volume flow, start delay per channel), Volume type, flow monitoring
Operation:	Keypad with 5 buttons
Display:	illuminated LC display, 4 lines each with 20 characters
Status signalling:	status display with two multi-colored LEDs, acoustic signal generator
Flow measurement:	flow sensor for each channel with upstream 10 µm protection filter cartridge
Accuracy:	volume flow: $\pm 2\%$ of the measured value plus $\pm 0,002$ SL/min volumes: $\pm 2,5\%$ of the measured value Specified for medium air at 25 °C
Climate sensors:	Air pressure using the internal barometric sensor, Temperature and humidity with optional external temp./humidity sensor HC2A-S
Operating temp.:	5 °C to 30 °C
Air conveying mechanism:	maintenance-free membrane pump with controlled brushless drive
Energy supply:	LiPo-battery pack 14.4 Volts, 3600 mAh
Buffer battery:	Lithium button cell CR2032

16. Technical Data (continued)

16. Technical Data (continued)

Sample-air connection:	via lockable pluggable couplings made out of metal with valves and hose fittings for hoses with a 4 mm inner diameter
Data connection:	USB socket (Type B) on the rear side
Dimensions:	180 mm x 125 mm x 255 mm (W x H x D)
Weight:	2480 g
Housing material:	Anodized aluminum profile housing
Tripod socket:	UNC 1/4 inch (photo) and UNC 3/8 inch (microphone)
CE compliance:	The Declaration of Conformity can be downloaded from the manufacturer's web page
Calibration interval:	Recommendation: after 300 operating hours, at least every 2 years
Warranty:	24 months, battery pack: 12 months

Charger:

Input voltage:	100 to 240 Volt, 50 to 60 Hz
Charging current:	2 A when quick charging
Compliance:	CE, UL 60601

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Optional accessories:

Temp. / humidity sensor:	rotronic Hygroclip2 Advanced (HC2A-S), can be plugged into the socket of the climate package
Sample-media bracket:	for fixing the sample-media, approx. 25 cm, with quick release plate
Handling case:	system with PE foam cut-outs, available in light gray, anthracite and sapphire blue

Note: **Subject to technical changes**

17. Conditions of Warranty

17. Conditions of Warranty

Umweltanalytik Holbach GmbH grants 24 months of warranty on this product after the date of purchase. In case of malfunctions of operation, please consult your dealer or supplier.

We reserve the right to repair or replace. The parts used for this are new or as good as new. Returned parts become property of Umweltanalytik Holbach GmbH. A repair under warranty does not extend the warranty of the parts or the products itself. Excluded from warranty are damages caused by improper treatment, operational errors, misuse, external influences, lightning/surge, alterations of the product as well as added parts. Furthermore, consumable parts (e.g. batteries, fuses) as well as damages caused by consumable parts (e.g. by the leaking of batteries). Also excluded is transport damage, subsequent damage, costs as a result of failure and travelling times. The warranty expires if repairs are done by non-authorized entities or if the serial number on the products is damaged or made illegible.

The warranty can only be claimed against presentation of an explicit receipt of purchase (invoice or sales receipt).

In case of warranty claim/repair, the device should be shipped carefully packed (if possible in its original packing and a shipping box) with a detailed description of the fault, sufficiently post paid to your dealer or to Umweltanalytik Holbach GmbH.

Shipments without freight prepaid will not be accepted.

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Issued: 10/2017
Hardware version 1.10
Firmware version: 2.3.0

18. The Program BiVOC2.EXE

18. The Program BiVOC2.EXE

The program BiVOC2.EXE is on the data media as part of the delivery and is for remote control, configuration of the **BiVOC2**, for data transfer of stored sampling data and for entering the adjustment data.

Apart from entering the adjustment data all other settings can be done directly on the **BiVOC2** itself (Section 11: Settings). The program BiVOC2.EXE is not required for sampling.

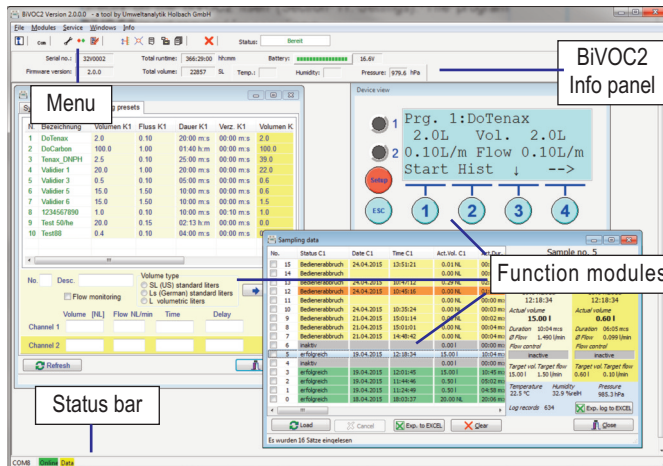


Figure 24 The program BiVOC2.EXE for **BiVOC2**

18. The Program BiVOC2.EXE

18.1 Installation of BiVOC2.EXE

18.1.1 System Requirements

To successfully install and operate BiVOC2.EXE you require the following:

- ▶ A runnable PC system:
 - ▷ with Microsoft Windows XP, Vista, Win7 or Win8 with a USB 2.0 interface
 - ▷ depending on the operating system administrator privileges
- ▶ The installation software from the storage media delivered with the **BiVOC2** or as a download from the manufacturer's website
- ▶ The USB connecting cable (part of delivery)
- ▶ Microsoft EXCEL for the generation of the output log (EXCEL is **not** part of the **BiVOC2** delivery)

18.1.2 Installation

Start the program "BiVOC2_Setup.exe" from the directory BiVOC2\English\Program on the data medium with a double click.

When asked for authorization as shown in picture 25, click on "Allow" / "Yes". The installation wizard starts and guides you through the installation.

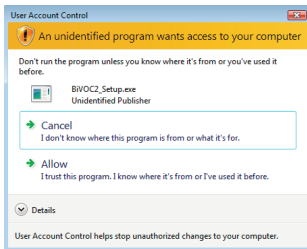
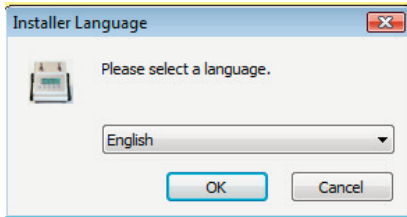


Figure 25 Authorization query in Vista

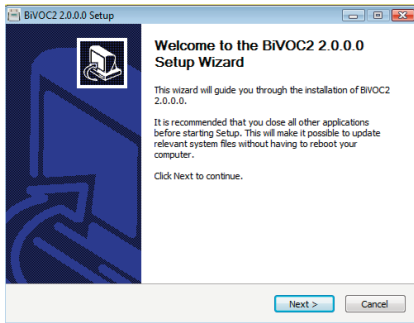
18. The Program BiVOC2.EXE



You can select German or English for the installation.

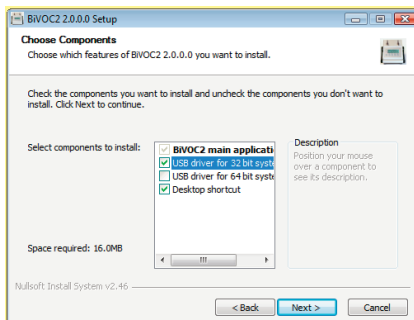
Click on OK.

Figure 27 Language selection for the installation



Click on Next.

Figure 28 The installation wizard

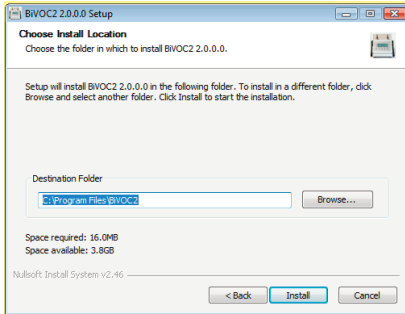


Choose the components to be installed. The respective USB driver (64 bit or 32 bit) should be installed upon the first installation.

Click on Next.

Figure 29 Components for installation

18. The Program BiVOC2.EXE



The installation directory of BiVOC2.EXE can be changed.

Click on Install.

Figure 30 Selection of the installation directory



The installation of the USB driver will be started.

Click on Next

Figure 31 Installation of the USB driver

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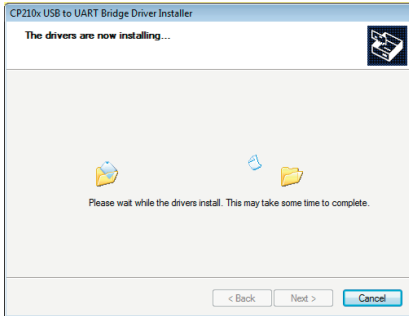


Please read and accept the license agreement.

Click on Next

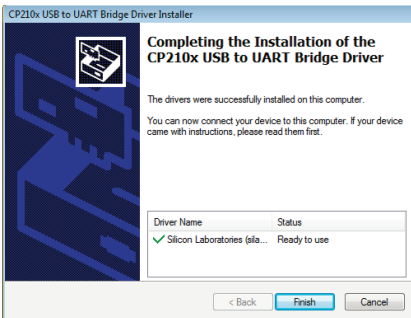
Figure 32 License agreement of the USB driver

18. The Program BiVOC2.EXE



Please wait patiently

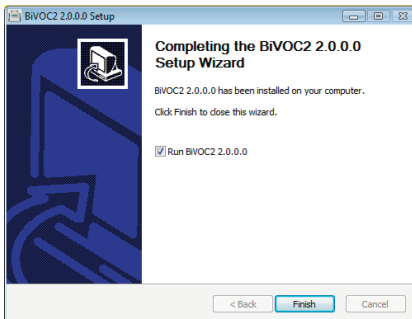
Figure 33 The USB driver is being installed



After the installation of the USB driver click on “Finish”.

Figure 34 The USB driver has been installed

18



Click on “Finish”.

After the installation finished successfully you will


find the icon  of BiVOC2.EXE on the desktop and in the start menu.

Figure 35 The installation of BiVOC2.EXE is finished

18. The Program BiVOC2.EXE

Switch on the **BiVOC2**.

Remove the dust cap from the USB socket of the **BiVOC2** and connect the **BiVOC2** with the delivered cable to the PC.

18.1.3 First Launch of BiVOC2.EXE

Launch the program BiVOC2.EXE.

The program BiVOC2 .EXE will open.

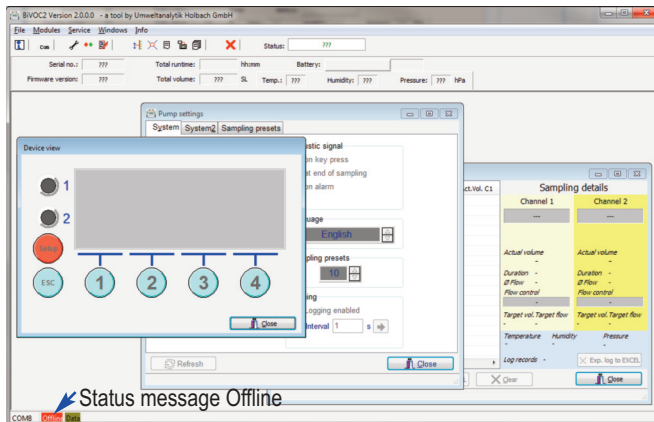


Figure 36 First launch of BiVOC2.EXE

18

On the first launch of the program it will try to automatically find the correct port for the connection to **BiVOC2**. Start and success of this search are each acknowledged with a message (Figure 37). The number of the found port (in Figure 37: COM5) depends on your PC system.

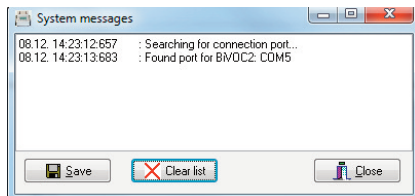


Figure 37 Messages during the automatic port search

18. The Program BiVOC2.EXE

If you want to perform the automatic port search again later, e.g. because the port number changed, you can start it via the menu item “File” -> “Search for connection port...” (Figure 38).

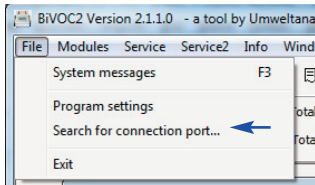


Figure 38 Menu item for automatic port search

Upon successful connection, the green online field (Figure 40) will be shown in the status bar. The serial number, the operating time, the battery voltage and the operating mode of the connected **BiVOC2** are displayed in the information panel.

If a connection to the **BiVOC2** cannot be established check the following:

1. Is the **BiVOC2** switched on?
2. Is the connection cable plugged into the USB socket on the **BiVOC2** and the PC?
3. Is the correct communication port selected in the program settings?

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Note: The automatic port search only works reliably if there is only **one** compatible device connected. If no connection can be established even after the search, please configure the port manually in the program settings (Page 56).



18. The Program BiVOC2.EXE

18.2 Using BiVOC2.EXE

The program form (Figure 23) for the BiVOC2.EXE contains:

1. Menu in both text and icon form for opening the functions modules
2. **BiVOC2** information panel containing the operating time etc.
3. Working area for the function modules
4. Status bar for showing the communication

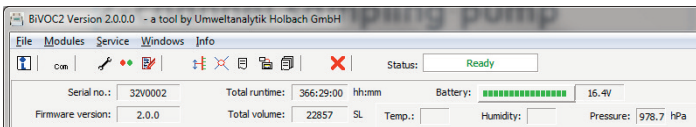


Figure 39 Menu and info panel

18.2.1 The Menu

The following functions can be reached via the menu or function key:

Symbol	Menu	F key	Function
	File -> System messages	F3	Opens a window with system messages
	File -> Program settings		Program configuration
	Modules -> Pump settings	F2	Configuration of BiVOC2
	Modules -> Device view		Device view of BiVOC2
	Modules -> Sampling data	F6	To load sampling data from BiVOC2
	File -> Exit		Closes BiVOC2.EXE

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The following modules are only visible when the service modules in the program settings are enabled:

	Service -> Adjustment data		For modifying the adjustment data
	Service -> Manual operation		Manual control of the valves and pump for service purposes
	Service -> Configuration via text files		Communication with the BiVOC2 at the telegram level
	Service -> BiVOC2 firmware upgrade		For upgrading the operating system of BiVOC2
	Service -> Service test results		Shows the results of the service test and the valve adjustment

18. The Program BiVOC2.EXE

18.2.2 The Status Bar of the Program Window

The status bar shows the following:

1. the set port number for the connection
2. the communication status
3. the transmit event of a query from the PC to **BiVOC2**
4. system messages (alarm messages are displayed in red)

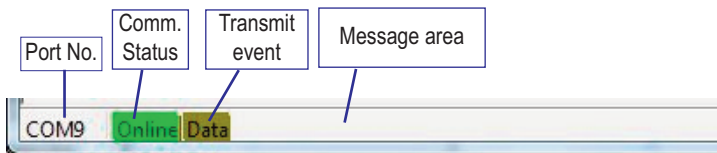



Figure 40 Status bar (here without messages)

18.2.3 System Messages

System messages are shown in a special system messages window. If there is an alarm, the window opens on its own. It can be opened and closed with the function key [F3]. The size and position of the system messages window are stored. The system messages window can also be placed outside of the main form.

18.2.4 Program Settings

The program settings are used to adapt BiVOC2.EXE to the installation environment and the connected **BiVOC2** system. Changes are only accepted if you click on  Save before closing the form.

18. The Program BiVOC2.EXE

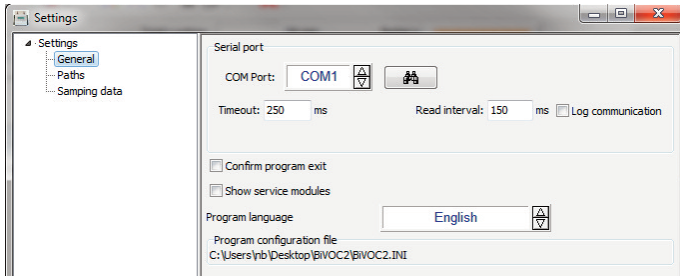



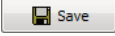



Figure 41 Program settings form, Section “General”

In the group “Serial port” the communication port to connect to **BiVOC2** can be configured manually. By clicking on  a list with currently available ports will be opened. Select the entry labeled “Silicon Labs CP210x USB to UART Bridge” by double-clicking on it.

With the checkbox “Log communication” you can enable a readable recording of the data communication. This can be helpful when there are problems with the communication. The output path for this data can be set in the “Paths” section.

You can choose between German and English as program language by clicking on one of the both arrows   and on  afterwards. If the box “Confirm program exit” is checked, a confirmation query is shown on program exit.

The option “Show service modules” is to show or hide the service function in the menu.

In the following input fields for folders and files the path can be entered either by hand or using a selection dialog which can be opened by clicking on  next to the field.

18. The Program BiVOC2.EXE

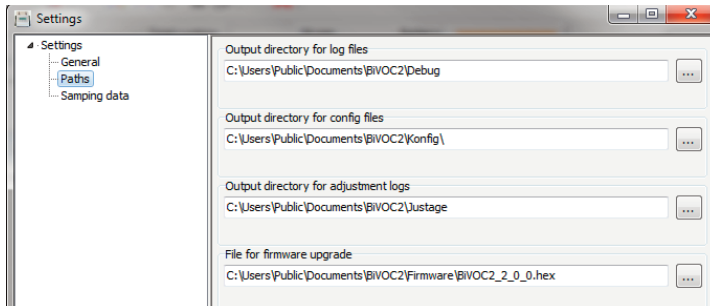


Figure 42 Program settings form, Section "Paths"

The output folder for the communication log data can be set at "Output directory for log files".

The item "Output directory for config files" is only for service purposes. If you want to perform an adjustment of **BiVOC2** on your own, the output path for the corresponding log files can be set at "Output directory for adjustment logs".

Select the corresponding program file for **BiVOC2** in Intel HEX format in the group "File for firmware upgrade".

In the section "Sampling data" in the program settings you can set the paths for saving the sampling data.

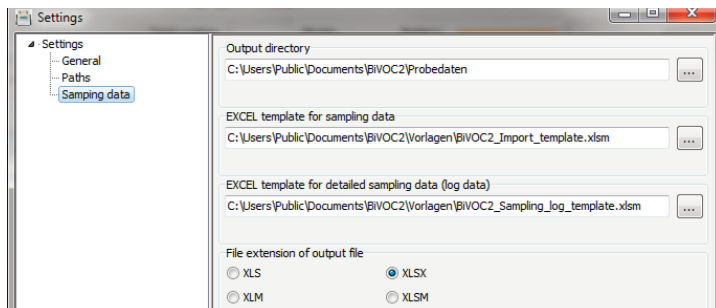


Figure 43 Program settings form, Section "Sampling data"

18. The Program BiVOC2.EXE

During installation an EXCEL template file is installed for the export of the sampling data and export of the sampling log data.

Adapt the template file as necessary, especially the heading in the spreadsheet “Protocol” and if necessary the macro “Pumpe_Start”.

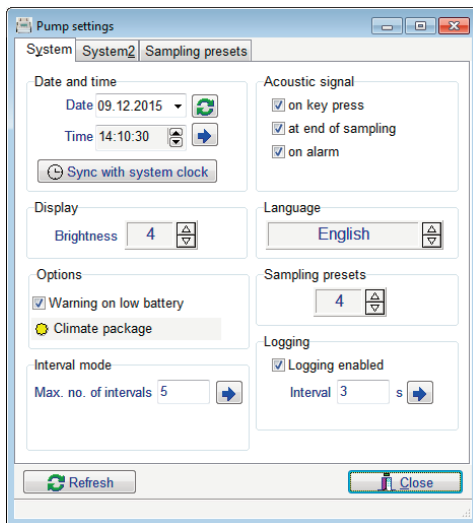
The directory and the names of the template files are entered in the fields “EXCEL template for sampling data” and “EXCEL template for detailed sampling data (Logging data)”.

In the field “Output directory” the directory is selected/entered where the processed EXCEL log with the sampling data are to be saved.

Select the file name extension corresponding to your EXCEL version in the field “File extension of output file”. The entry is only used when no template file is available.

18.2.5 Configuration of BiVOC2

Using the module “Pump settings” (Function key [F2]) you can view and change the **BiVOC2** settings (Section 11).

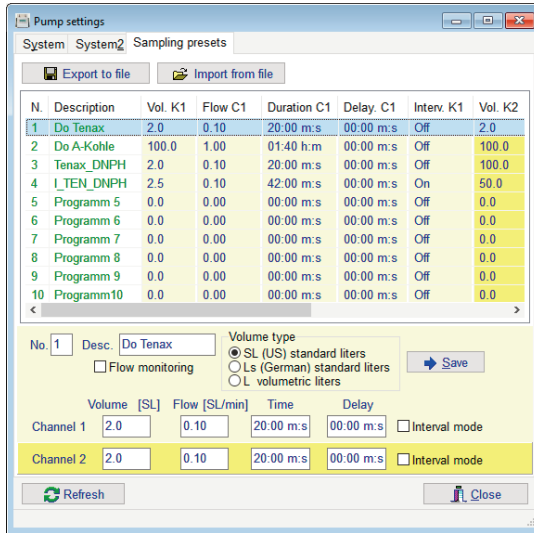


18

Figure 44 Pump settings, System tab

18. The Program BiVOC2.EXE

Numerical changes take effect after leaving the field with the tab key or by clicking on another field. Other changes take effect in **BiVOC2** immediately.




List area

Edit area

Figure 45 Pump settings, Sampling presets tab

Pre-setting data can easily be changed in the “Sampling presets” tab. After clicking on the button “Refresh” the list is loaded. The current presettings are shown in the list area. The descriptions in green are shown in **BiVOC2**, the other sampling data are not shown due to the setting “Sampling presets” in the “System” tab.

Clicking or double-clicking on a program in the list transfers the data of this program to the edit area and can then be changed.

Clicking on the button  saves the changed program data in the **BiVOC2**.

The button  is for exporting the preset programs to a file. These files can be imported using the  button. On import, the programs will be directly transferred to **BiVOC2**.

18. The Program BiVOC2.EXE

18.2.6 Device View Module

This module shows the display contents of the **BiVOC2**. Additionally, the buttons can be pressed. The button “Setup” corresponds to a long press of the Esc/Setup button.

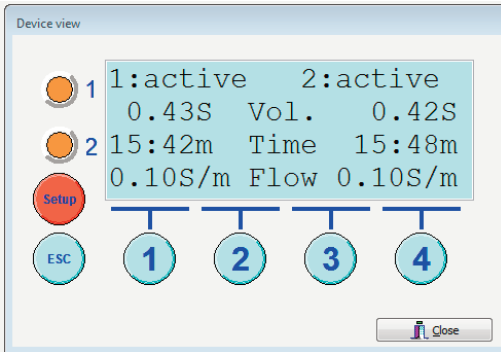



Figure 46 Device view module

18.2.7 Sampling Data Module

After calling this module, clicking the button  causes the sampling data to be read and shown in the list.

The status of the sampling is indicated with a corresponding background color and also in plain text.

18

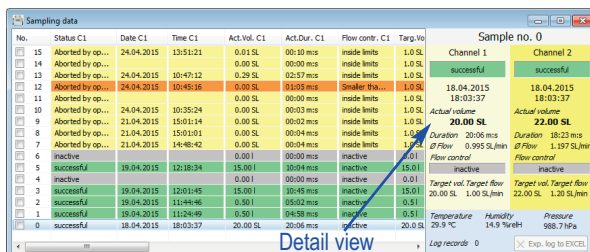
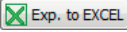


Figure 47 Sampling data module

The data of the sampling selected in the list are clearly represented in the detail view.

18. The Program BiVOC2.EXE

The data can be transferred directly to an EXCEL spreadsheet by clicking the button . The data to be exported have to be selected with the checkboxes on the left. The functions “Select all sampling data” and “Clear all selections” can be triggered with the right mouse button.

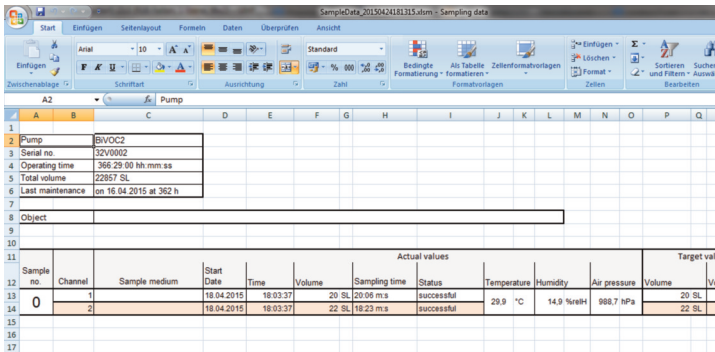


Figure 48 Sampling data in an EXCEL spreadsheet (with template file)

The sampling data is written into the “Import” sheet from line 20 onwards. With the template file the macro “Pumpe_Start” transfers data into the “Protocol” sheet and processes them.

The sampling process log is loaded from **BiVOC2** and exported to EXCEL by clicking on “Exp. log to EXCEL”.

18

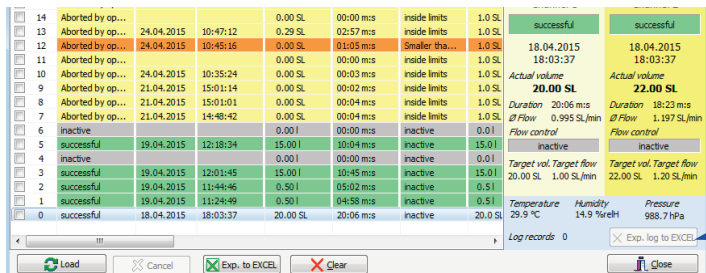


Figure 49 Transfer sampling log to EXCEL

18. The Program BiVOC2.EXE

18.2.7 Adjustment Data Module

Incorrect changes to adjustment data can cause **BiVOC2** to fail. A warning is given.

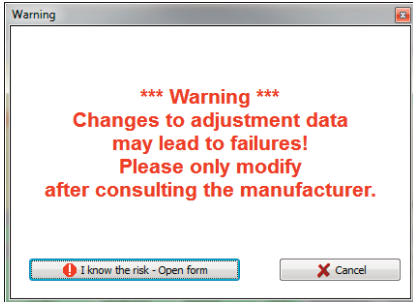
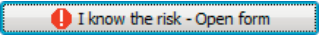
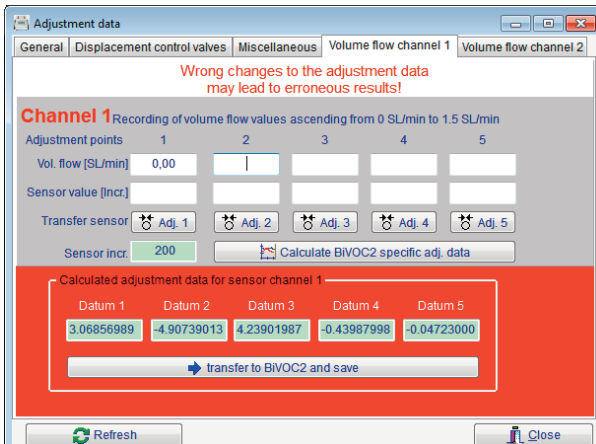


Figure 50 Warning when opening the adjustment data module

After clicking the button  the adjustment data form is shown. The form contains the tabs: “General”, “Displacement control valves”, “Miscellaneous”, “Volume flow channel 1” and “Volume flow channel 2”.



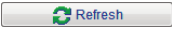


18

Figure 51 Adjustment data, here: Volume flow channel 1

18. The Program BiVOC2.EXE

Changes to the adjustment data are stored as an event in the **BiVOC2** and can be read from **BiVOC2** by a service engineer.



The adjustment data is loaded by clicking the button  and is shown in the fields. Modified data is written to **BiVOC2** by clicking the button  or .

The adjustment of the volume flow measurement is described for channel 1 in the following. The adjustment of channel 2 is performed in just the same way.

The adjustment may only be carried out by experienced and qualified personnel.






The adjustment only takes place with the volume type SL (US-standard liters).

For the adjustment you will need a reference volume flow measuring device (not part of the **BiVOC2** delivery) with a measurement range from 0.05 SL/min to approx. 1.6 SL/min.

The adjustment is made as a 5-point adjustment.

The real flow values and the raw sensor values are determined at 5 points and converted to **BiVOC2**-specific adjustment values.

The first adjustment point is always at 0 SL/min. We recommend further adjustment points at 0.09 SL/min, 0.2 SL/min, 1.9 SL/min and 1.5 SL/min.

Create or modify a sampling preset program with the corresponding flow adjustment point. Start the sampling. After the line-up process press the button "Adj. <Adjustment point>" (e.g.  for adjustment point 2). Enter the value of the reference measurement device into the corresponding field "Vol. flow [SL/min]". Once all 5 adjustment points are determined the **BiVOC2**-specific adjustment values can be calculated by clicking the button  and then transferred to **BiVOC2** by clicking on the button . The adjustment values are logged in the file <Serial no.><DateTimeStamp>.CSV in the directory for adjustment logs.

18. The Program BiVOC2.EXE

18.2.8 Manual Operation Module

The manual operation module is used for service purposes and can be used as an alternative to manually set the volume flow when making adjustments.

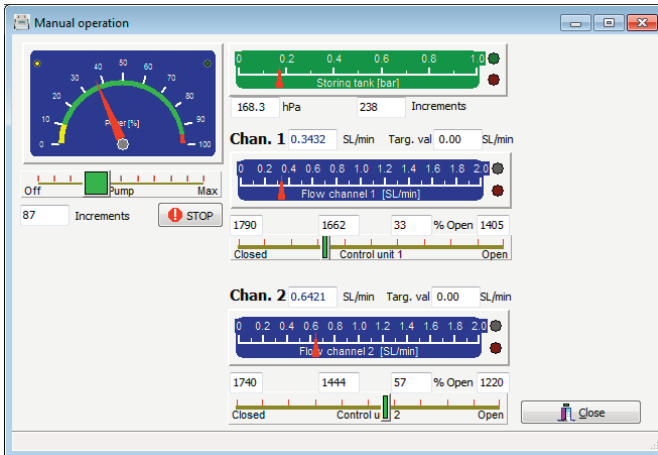


Figure 52 Manual operation

By sliding the green sliders the pump in **BiVOC2** and the valves can be manually controlled.

Note: The pressure information for the pressure storing tank cannot be adjusted and can indicate small values even though there is no pressure due to the sensor.

18

18. The Program BiVOC2.EXE

18.2.9 Firmware Upgrade

Only carry out an upgrade after consultation with the manufacturer!



The operating system (firmware) of **BiVOC2** can be upgraded by clicking on the button “Start upgrade”. This causes the file selected in the group “File for firmware update” in the program settings to be transferred to **BiVOC2**.

Before the transfer the **BiVOC2** is switched to “Boot loader mode” and a reset takes place.

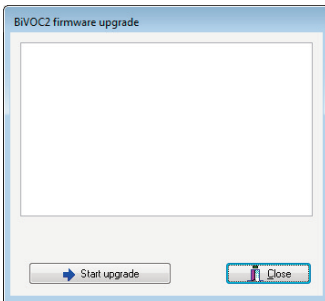


Figure 53 Firmware upgrade module

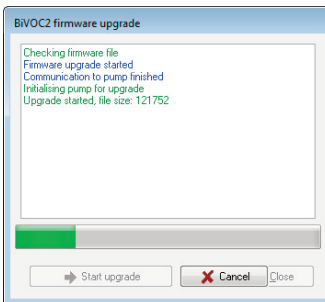
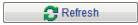


Figure 54 Firmware upgrade in progress

18. The Program BiVOC2.EXE

18.2.10 Result Display of the Internal Service Tests

The results of the valve adjustment and the tightness tests can be displayed with date and time by pressing the button .

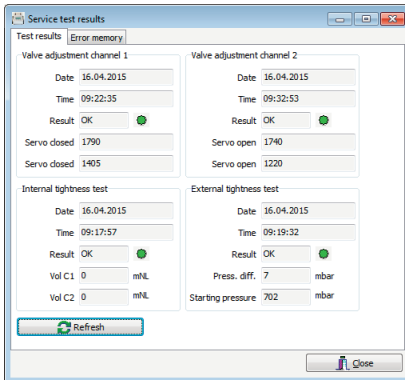
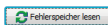


Figure 55 Display of the tests and adjustment results

The **BiVOC2** has an integrated error memory to record date and time of errors occurring during the operation. By clicking the button



the content of the error memory can be displayed.

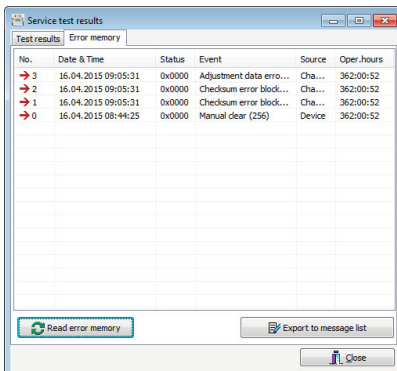


Figure 56 Error memory

Appendix A: Volume Types

The volume flow in the **BiVOC2** is measured for each channel using a mass flow sensor. The level of the electrical output signal from the flow sensors depends on the mass of the flowing air.

The measured value is scaled to US-standard liters / min (SL/min) and corresponds to the volume flow with a temperature of 0 °C and air pressure of 1013.25 hPa.

It is customary also to use German-standard liters / min (Ls/min) relating to 20 °C and 1013.25 hPa.

The conversion from US-standard liters to German-standard liters is done with the following equation:

$$\text{Volume in Ls} = \text{Volume in SL} * \frac{293.15 \text{ K}}{273.15 \text{ K}}$$

To calculate the actual volume flow from the US-standard liters (SL) the air pressure and the temperature need to be known.

The conversion is done with the following equation:

$$\text{Volume in L} = \text{Volume in SL} * \frac{T_x * 1013.25}{273.15 * P_x}$$

T_x = current temperature in K

P_x = current air pressure in hPa

A

Appendix A: Volume Types

Appendix A: Volume Types (continued)

BiVOC2 converts the desired volume types on its own. For calculating the actual volume the optional external temperature/humidity sensor is required.

Volume type	Reference temperature	Reference pressure	Units	Icon in the display
US-standard liters	0 °C	1013.25 hPa	SL	☒
German-standard liters	20 °C	1013.25 hPa	Ls, l _s	☒
actual liters	current temperature	current air pressure	L, l	L

A

Appendix B: Power-On Options

Pressing the buttons no. 1 or no. 2 during power-on (button on the device rear) offers additional functionality of the **BiVOC2**:

Button no. 1 switches the **BiVOC2** to firmware upgrade mode (boot loader). The controller in the **BiVOC2** has an additional program that allows a complete upgrade of the firmware via the USB interface.

When activated the status LED of channel 1 lights up and the LC display remains dark.

To leave the mode press the button on the rear side for approximately 12 seconds until the red LED turns off. Then switch-on the **BiVOC2** again.

Button no. 2 switches directly to the service function menu after power-on (Section 12).

Appendix C: Troubleshooting

This appendix lists possible **BiVOC2** faults together with corrective solutions.

Fault	Possible solution
BiVOC2 cannot be switched on.	Charge battery, press the on / off button for more than 12 seconds (reset will be performed), have the fuses in the device checked.
BiVOC2 cannot be switched on. The status LED for channel 1 is constantly red.	The boot loader has been activated, press the on / off button for more than 12 seconds to reset the device.
BiVOC2 does not switch off automatically when there is no activity.	Check the settings whether the automatic power-off is enabled

BiVOC2 error messages **after** power-on and **before** a sampling

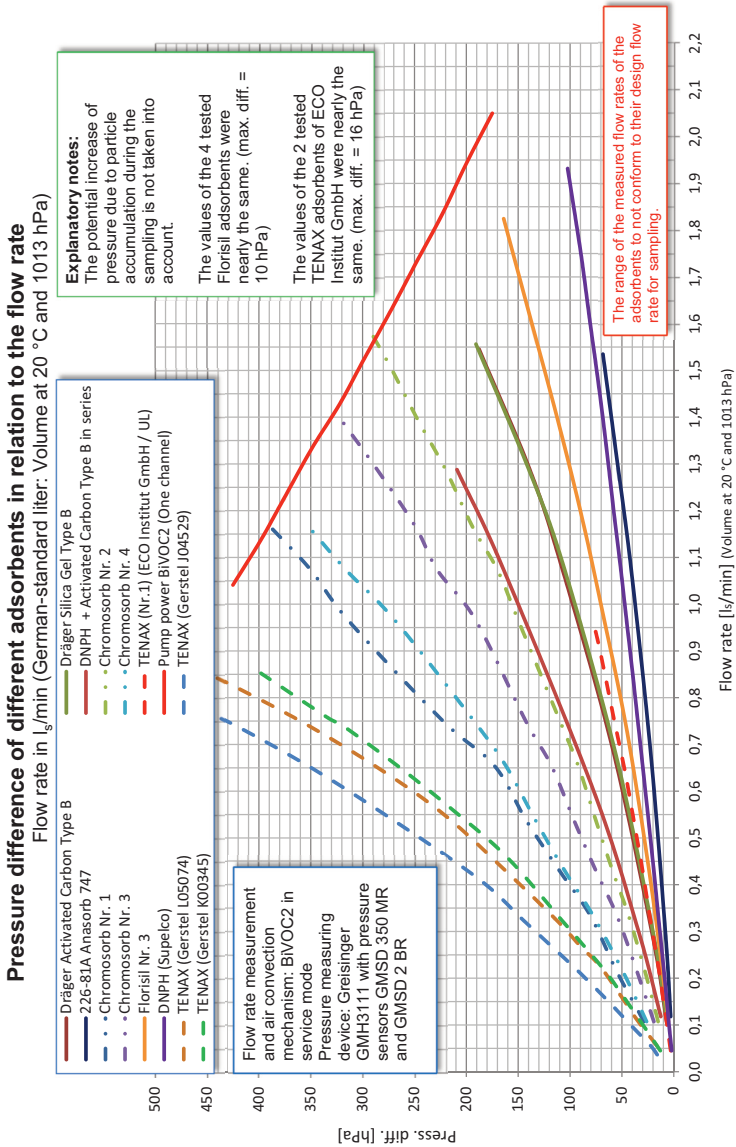
Error message	Possible solution
Warning "RTC data error"	If this warning occurs frequently, it may be that the buffer battery for the clock circuit is low. Manufacturer service!
Warning "Sample data error"	Delete sampling data, section 11.4 Buffer battery may be low.
Press. sensor error	No corrective solution possible, send the BiVOC2 for repair (manufacturer service!)
Flow sensor error	Information according to section 10.2 Adjustment data incorrect: Re-transmit Sensor faulty: Manufacturer service!
Battery low! Pls. charge battery	Recharge battery pack (section 13.1) or switch-off BiVOC2 (section 5.1)
Volume flow is not 0	If no external volume flow is connected to the channel: Contact the manufacturer

C

Appendix C: Troubleshooting**BiVOC2** error message during sampling

Error message	Possible solution
Battery low! Pls. charge battery	Recharge battery pack (section 13.1) or switch-off BiVOC2 (section 5.1)
Pump motor error	If a start-up sound was audible, restart sampling. Otherwise return the BiVOC2 for repair (manufacturer service!)

Appendix D: Difference Pressures of Adsorbents



D

