Alarms in DiaBox

Restrictions

This document describes the configuration and function of alarms for Freestyle Libre 2 sensors from Abbott in the DiaBox app for Android and iOS.
It does not describe the connection of smartwatches or fitness trackers and the alerting with these devices.
A stable and secure Bluetooth connection is a prerequisite for reliable alarming functionality.

General Information on Alarms

Alarms are used to warn of unforeseen events, which draws attention to imminent danger to health, life or objects / things.

In this case, the alarms are used to monitor the glucose values of the Freestyle Libre sensor and the status of the device.
Alarms provide security because you don't always have to keep an eye on the glucose value.
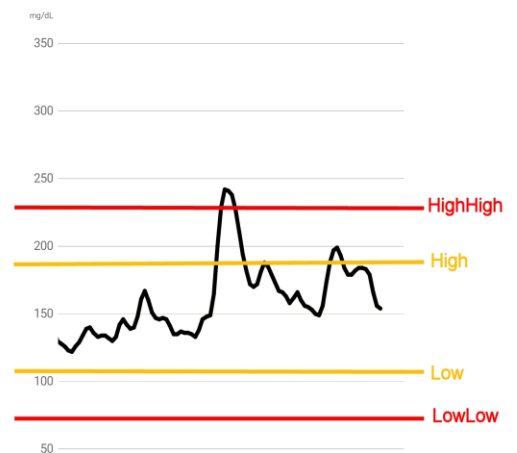
Glucose Alarms

Glucose Level alarms

These alarms warn when glucose exceeds or falls below an absolute limit value:

- Warning if the high limit values are exceeded. This enables better analysis and avoidance of excess sugar.

- Warning if the low limit values are exceeded (a set hypoglycaemia threshold). This enables a faster treatment of hypoglycaemia.

Several alarms of one type (such as Low and LowLow) offer more flexibility, e.g. for use **as pre-alarm and main alarm**.

Pre-alarms:

Pre-alarms enable a "predictive" warning of excess and hypoglycaemia. They signal when it is foreseeable that if the current trend continues for a certain period of time, the glucose will trigger a high or low alarm. Earlier countermeasures are thus possible.
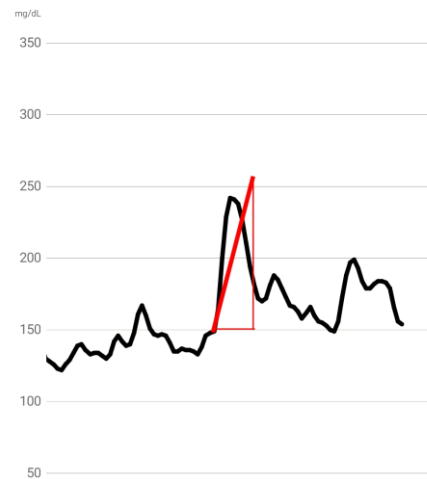
Rate of change alarms

These alarms signal a too rapid change in the glucose value per unit of time, i.e. too great a slope of the change.

Often separate limit values can be given for the rise and fall of glucose.

System alarms

System alarms warn of system malfunctions, such as communication failures, sensor errors, etc..

Signaling of alarms

Alarms can be signaled

- visually by indication on the display,
- acoustically through signal tones,
- haptic through vibration,
- through notifications,
- by passing it on to a smartwatch / fitness tracker

Alarms in DiaBox

The following alarm types are offered in DiaBox:

Glucose Level Alarms

- Extreme High ("HighHigh")[1]
- High
- Low
- Urgent Low ("LowLow")

Rate Of Change Aalarms

- Rise Rate
- Drop Rate

System Alarms

Device

- Signal loss
- Battery low[2]

Sensor

- End before
- Miss reading

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[1] The Extreme Low alarm is unfortunately not fully implemented in DiaBox. It is not possible to configure the alarm options.

[2] These alarms presumably only apply when coupled with the Bubble Transmitter.

Configuration Of The Alarms

1. Setting the alarm limits

① Tap on the configuration "gear" in the main screen, then the configuration dialog opens.

② There tap on "Settings".

The settings display appears, the limit values of the glucose level alarms are in the lower area. ③

④ If you tap on the respective alarm type, a dialog opens in which the limit value can be adjusted (example High alarm).
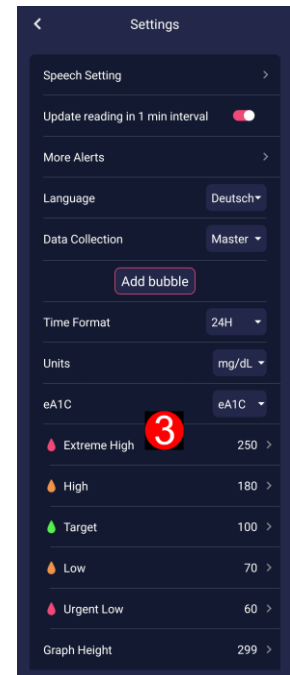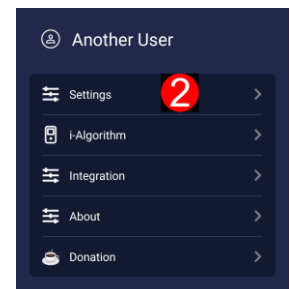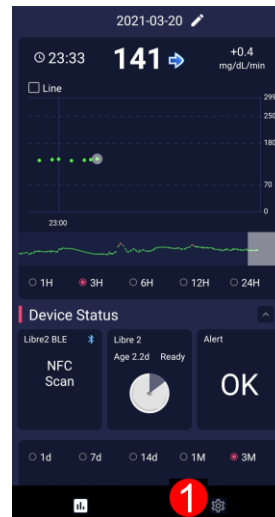
Setting ranges of the glucose level alarms

Setting ranges of Extreme High ("HighHigh") limit value:[3]
144 mg/dL - xxx mg/dL resp. 8.8 mmol/L – 16.5 mmol/L

Setting ranges of High limit value:
90 mg/dL – 269 mg/dL resp. 5.8 mmol/L – 15.7 mmol/L

Setting ranges Low limit value:
36 mg/dL - 107 mg/dL resp. 2.5 mmol/L – 6.7 mmol/L

Setting ranges Urgent Low ("LowLow") limit value:
6 mg/dL - 71 mg/dL resp. 2.2 mmol/L – 4.7 mmol/L

The following rules apply:

Extreme High ("HighHigh") limit value > High limit value

Urgent Low ("LowLow") limit value < Low limit value

Note: If you adjust eg the Extreme High limit value lower than the High value, DiaBox automatically pulls the High limit value down as well, so it is recommended to check the limit values afterwards.

Correspondingly, an adjustment of the Urgent Low limit value to a value greater than the Low limit value pulls the Low value up.

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[3] The Extreme High alarm is not fully implemented. Although the limit value can be set, the other alarm options of the alarm cannot be used.

Special feature of the High and Low limit values

In DiaBox, the High and Low limit values for alarms simultaneously define the target glucose range.

The target glucose range is shown in color in the glucose curve and is used in statistical calculations such as TIR ("Time in Range").[4]

In the LibreLink app or the Libre reader, on the other hand, there are separate limit values for High and Low alarms and the target glucose range.


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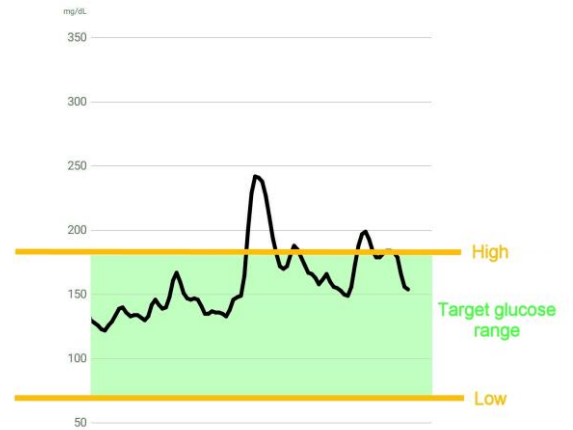
[4] See FAQ: Can I emulate the alarm behavior of the LibreLink app in DiaBox?

2. Set the alarm options

❶ On the Settings screen, tap **More Alerts**.

❷ The alarm dialog ("Alert Screen") opens for setting the alarm options (snooze time, alarm tones, vibration mode) for the glucose and system alarms.

❸ In the area of **Glucose alarms**, the snooze time can be set in minutes with the buttons on the left.[5]
Note: The **"Off"** entry disables this alarm completely.

❹ The right buttons switch the vibration mode for the alarm on or off.
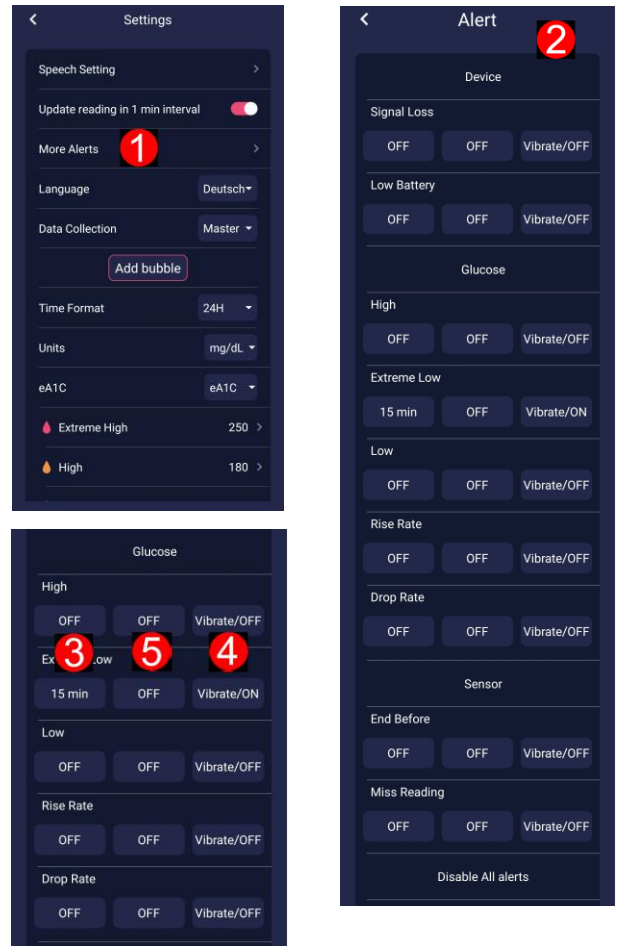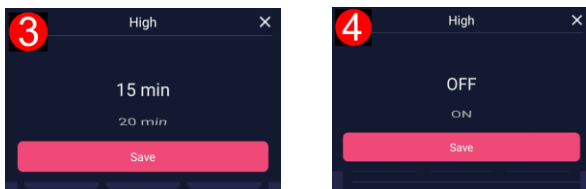
❺ The middle buttons open a dialog for selecting the alarm tones.
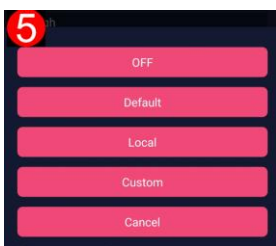
Off: turns off the alarm tone for this alarm.
**Default:** the alarm tone preset in DiaBox is used.
Local: An alarm tone can be selected from a list of sounds preset in DiaBox. ❻
Custom: A "File Manager" dialog opens in which you can select your own alarm tone. ❼
Note: The following sound formats are supported: mp3,amr, flac, m4a, mp2, ogg, opus, wav, wma,…[6]
Note: the sound file must be located on the internal memory of the smartphone.
Cancel: The dialog is terminated without saving any changes.

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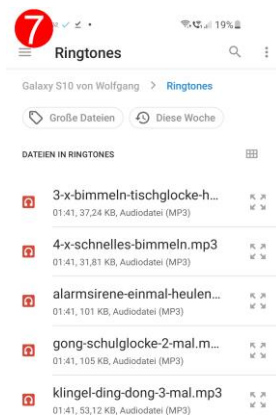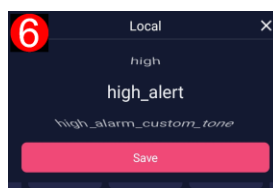
[5] See FAQ: What does "snooze time" actually mean ?

[6] To be verified

Settings oft the Rate Of Change alarms

The setting of the rate of change alarms is somewhat different in the area of **glucose alarms**. The buttons on the left set the limit for the rate of change for

⑧ the Rise Rate alarm and

⑨ the Drop Rate alarm.

Setting ranges Rise Rate alarm:
1.8 … 3.6 … 5.4 … 7.2 … 9.0 … 10.8 mg/dL / min resp.
0.1 … 0.2 … 0.3 … 0.4 … 0.5 … 0.6 mmol/L / min

Setting ranges Drop Rate alarm
-1.8 … -3.6 … -5.4 … -7.2 … -9.0 … -10.8 mg/dL / min resp.
-0.1 … -0.2 … -0.3 … -0.4 … -0.5 … -0.6   mmol/L / min

The **"Off"** entry disables the alarm off.

The middle and right buttons of both alarms work as already described and set the alarm tones and the vibration mode.

⑩ **Note:** The current amount of glucose value change per minute is displayed on the main screen at the top right.

Adjusting the volume when selecting a sound

The predefined alarm tones in DiaBox are quite loud. There are several ways to adjust the volume:

⑪ **Directly when selecting the alarm tone.**
After selecting an alarm tone via **Default / Local / Custom**, this sound is played. At the same time, an alarm volume slider appears, with which the volume can be changed; or you can use the volume buttons on your smartphone. However, the volume slider disappears after a few seconds.

⑫ **Override System Volume**
In the **Glucose Alarms** area, tap on **Glucose**, switch on **Override System Volume** there and set the desired volume. This value overrides the system volume.
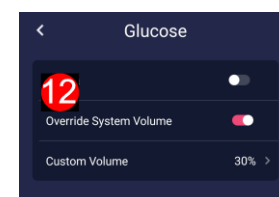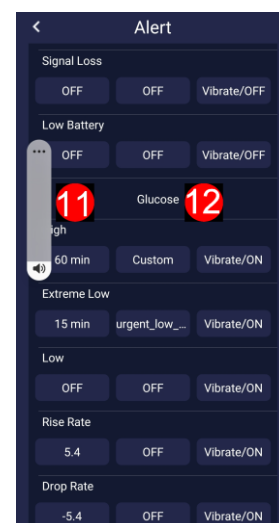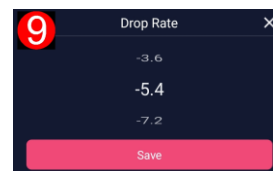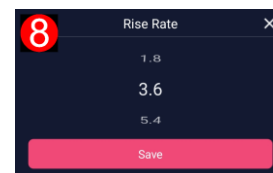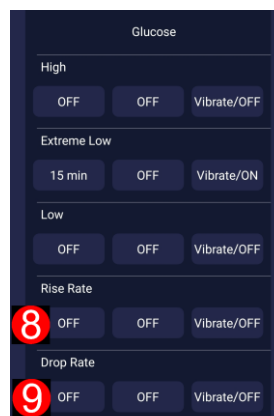
Alarm options of the system alarms in DiaBox

① The settings for the **Device system alarms** can be entered in the upper area of the alarm dialog ("Alert screen"). "Device" in this case means a Bubble transmitter, so this information cannot be used for the Libre 2 "BT direct" connection.

Signal loss alarm
Left button: Duration of signal loss until the alarm is triggered.

Battery low alarm[7]
Left button: Battery charge status for alerting.

The following applies again to both alarms:
Middle button: Selection of the alarm tone.
Right button: vibration mode
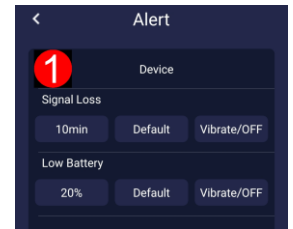
② The settings for the **Sensor system alarms** are in the lower area of the alarm dialog ("Alert screen").

End before alarm (expiration of sensor)
Left button: Days until the sensor expires for alerting.

Miss reading alarm (no values received)
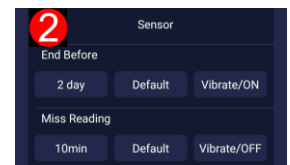Left button: Duration without receiving values for alarm.

The following applies to both alarms:
Middle button: Selection of the alarm tone.
Right button: vibration mode

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[7] These alarms <mark>presumably</mark> only apply when coupled with the Bubble Transmitter.
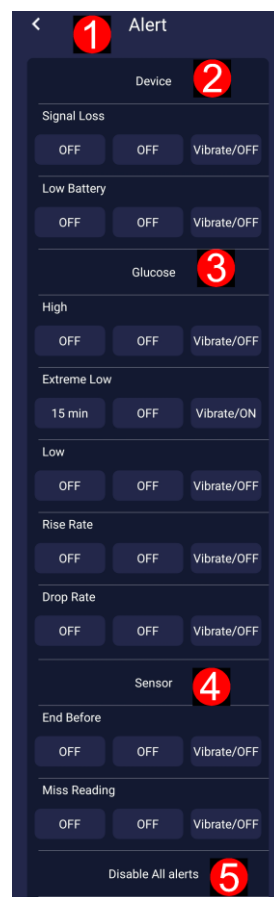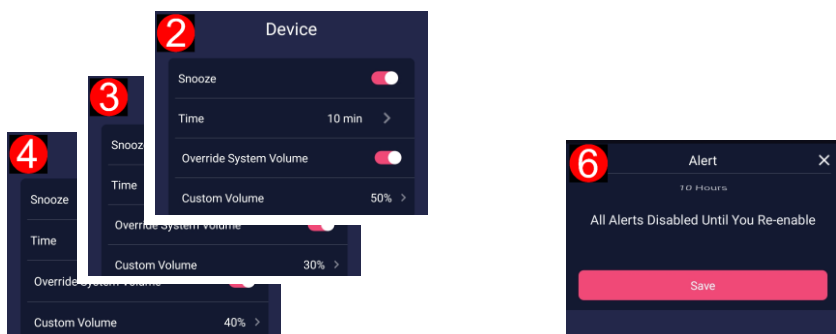
Group-wide and global settings

To simplify operation, settings can be made for the alarms of a group (glucose, device, sensor) or for all alarms together.

In the alarm dialog ("Alert screen") ❶

tapping on the group Glucose ❷ , Sensor ❸ or Device ❹ opens the respective glucose, device oder sensor dialog.

As already described when setting the alarm options for the glucose alarms, the desired volume can be selected with **Override System Volume**. This volume applies to all alarms in the respective group.

There is also a "Snooze" switch in the dialogs, with which the default snooze time can be set for all alarms in the respective group.
Note: group-wise setting of a default snooze time does not work

❻ At the end of the list of snooze times is the entry **"All Alerts Disabled Until You Re-enable"**. If you select this "snooze time", all alarms in this group are disabled, the alarm options in the alarm dialog ("Alert screen") are all switched off, i.e. they are set to Off (but are not deleted internally)

Disable all alarms

❺ At the bottom of the alert dialog ("Alert screen") is the entry **"Disable All Allerts"**. Here, too, the corresponding dialog opens and the entry **"All Alerts Disabled Until You Re-enable"** can be selected as the "snooze time". This means that all alarms in DiaBox are disabled now.

❼ **"All Alerts Snoozed"** is then displayed in the **Current Alert Status** field on the main screen.
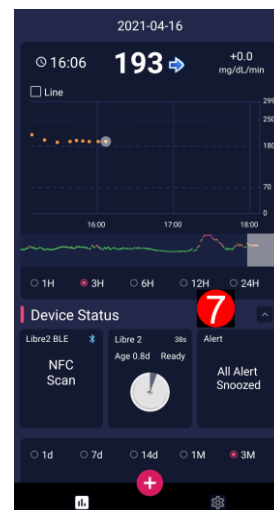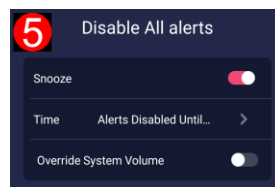
Using the alarms

Alarms in DiaBox can be signaled

❶ visually through the display (in the Current Status Field, only the glucose level alarms), all alarm types in the status line.

❷ acoustically through signal tones (all alarm types),

❸ haptically through vibration (all alarm types),

❹ in the notifications (all alarm types).

Signaling of alarms

Example High alarm

The glucose value exceeds the set High limit value:

❶ The alarm is displayed in the **Current Alert Status** field on the main screen.

❷ At the same time you are asked whether the alarm should pause ("snooze"), the suggested snooze time was preset in the alarm options.
The configured alarm tone sounds simultaneously (if a tone was selected) and the smartphone vibrates (if the vibration mode was switched on).

❸ An alarm volume slider appears briefly with which the volume can be changed; or you can use the volume buttons on your smartphone.

❷ If you press the "**Cancel**" button, the alarm remains enabled. If the next measured value (determined with a 1 min or 5 min update or by scanning) is still above the limit value, the alarm is signaled again.

❹ If you have selected the snooze mode, the alarm pauses for the set time ("**High Alert Snoozed**" is displayed). If the next measured value is still above the limit value after the snooze time has elapsed, the alarm is signaled again.
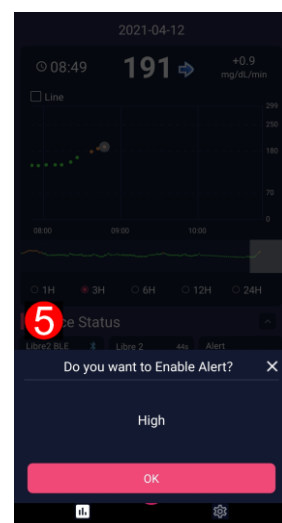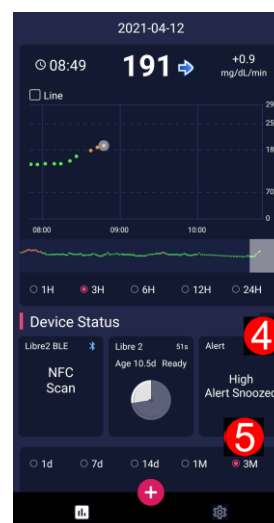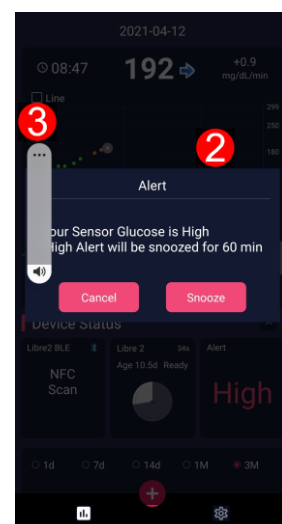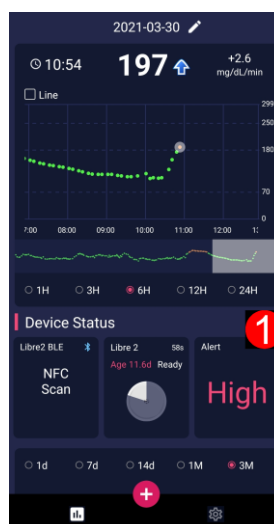
❺ The alarm can be enabled at any time during the snooze mode. Tapping on the **Current Alert Status** field opens the alarm release dialog.

❻ If the alarm is disabled ("snooze time" button in the alarm options set to **Off**) and the measured value exceeds the limit value, none of the described signaling occurs. In the **Current Alert Status** field, however, the current status of the alarm is shown as switched off **("High Alert Off"** in the example).
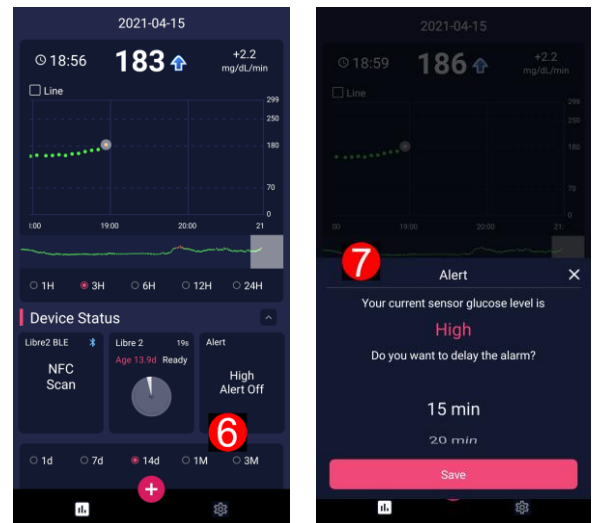
You can now enable the alarm again by tapping on the **Current Alert Status** field, ❻ and ❺.

If the next measured value is still above the limit value after the enabling of the alarm, the alarm is signaled again.

If the alarm is active, you can put the alarm into snooze mode at any time.

❶ Tapping on the **Current Alert Status** field opens the snooze dialog.

❼ There the new snooze time is freely selectable.

Hints:

In the **Current Alert Status** field only the status of the glucose level alarms is displayed.

If both glucose level limit values of one direction are violated, only the "more important" alarm is displayed, i.e. the "urgent low" or "extreme high" alarm.

Rate of change alarms are not reported in the **Current Alert Status** field, but these alarms are signaled by an alarm tone and vibration (if the alarm options have been set for these alarms).

The same behavior applies to the system alarms (device and sensor related alarms).

Group-wide and global settings

As already mentioned in the description of the alarm configuration, the alarms of a group (glucose, device, sensor) or all alarms can be switched off (**Disable all alarms**) to simplify operation.

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FAQ – Frequently Asked Questions

What does "snooze time" actually mean ?

The snooze function can be imagined like the snooze button on an alarm clock.

If an alarm is activated and signalled, you can choose whether you want to use the snooze function. The alarm then pauses the preset snooze time and you are undisturbed for this period of time to carry out an appropriate action, e.g. to take some glucose in the event of a low alarm or to inject corrective insulin in the event of a high alarm.

Without pausing, the alarm is signaled again with the next measured value update (1 min / 5 min cycle or during scanning), if the limit value is still violated.

An alarm in snooze mode can be released at any time by tapping the Current Alert Status field on the main screen.

A released, still active alarm can be paused again and a new, freely selectable snooze time can be entered.

The behavior in DiaBox is therefore different from what you are used to from the LibreLink app / reader.

If an alarm is signaled and confirmed there ("End current alarm and test glucose"), the alarm is not signaled again, even if the measured value continues to violate the limit value. The measured value must first return to the normal range before a new alarm can be triggered.
The alarm is repeated every 5 minutes only without confirmation.

The implementation in DiaBox seems much more sensible.

The configuration of the default snooze time in DiaBox is a bit unusual, however.

In Configuration / Settings / More Alerts you can set the default snooze time with the left button of the alarm.
However, this only applies to the glucose level alarms.

Note: The configuration for groups (glucose, device, sensor) or for all alarms offers the option of setting a common default snooze time.
Here, however, only the setting **"All Alerts Disabled Until You Re-enable"** seems to work to disable these alarms. An individually adjustable snooze time is not possible for all alarms except for the glucose level alarms and a snooze function also makes little sense. A set snooze time has no effect here and also seems to disable the alarms.[8]

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[8] To be clarified

Can I emulate the alarm behavior of the LibreLink app in DiaBox ?

Special feature of the High and Low limit values

In DiaBox, the High and Low limit values for alarms simultaneously define the target glucose range.

The target glucose range is shown in color in the glucose curve and is used in statistical calculations such as TIR ("Time in Range").

In the Freestyle LibreLink app or the Libre reader, on the other hand, there are separate limit values for High and Low alarms and the target glucose range.
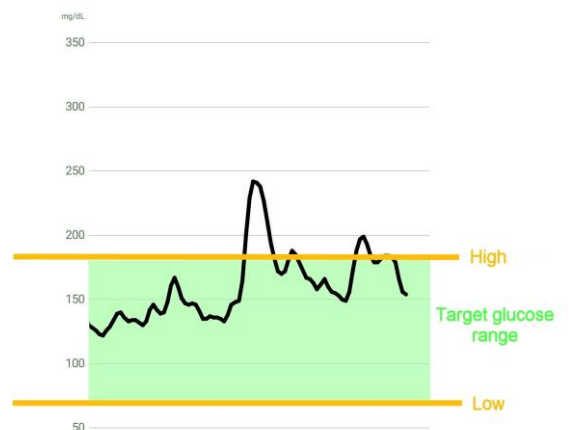
Emulating the Freestyle Libre behavior

You can imitate the behavior of the Freestyle LibreLink app / reader with restrictions:

Settings for the High and Low limit values are only used as limit values for the target glucose range, e.g. 70 - 180 mg/dL resp. 3.9 – 10.0 mmol/L, but the alarms are disabled in the alarm options dialog ("Alert screen") by setting the left "Snooze" buttons to "Off".

The "Extreme High" and "Urgent Low" alarms are then used as "normal" alarms.

Restrictions:

The "Extreme High" alarm cannot be used at the moment, as this alarm has no adjustable alarm options and the alarm is switched off by default.[9]

These alarms only signal when the measured value has already left the target glucose range, as the rules apply:

Extreme High limit value > High limit value
Urgent low limit value < Low limit value

It is therefore not possible to be alerted shortly before leaving the target glucose area.

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[9] This will be fixed in one of he next releases.

When are the alarms detected and signaled ?

The alarms are detected with the glucose measurement update, i.e. in a 1 min or 5 min cycle and also directly when the sensor is scanned.

The alarms are signalled with the same update behavior.

How can I adjust the volume?

When the alarm becomes active and the configured alarm tone sounds, an alarm volume slider appears briefly with which the volume can be changed. You can also use the smartphone's volume buttons.

As already described in the setting of the alarm options for the glucose level alarms, the desired volume can be preselected with the **Override System Volume** functionality. This volume then applies to all alarms in the respective group:

Tapping on the group (**glucose**, **sensor** or **device** alarms) in the alarm options dialog ("Alert screen") opens the respective glucose, device or sensor dialog.

[Configuration] -- [Settings] -- [More Alerts] -- [Device / Glucose / Sensor]

Turn on **Override System Volume** there and set the desired volume. This value overrides the system volume.

### Override System Volume for all alarms

At the bottom of the alarm options dialog ("Alert screen") there is the entry **"Disable All Allerts"**. Tap on it and here too the corresponding dialog opens and the desired volume can be set.

[Configuration] -- [Settings] -- [More Alerts] -- [Disable All Allerts]

Alarms as notification

The setting options and displays for notifications are so different and depending on the operating system (Android or iOS), the version of the operating system and the smartphone type, so only one example can be given here for notification under Android 11, Samsung S10 smartphone.

The notification for "Bubble" must be set in the example, even on a Libre 2 EU with a direct Bluetooth connection.
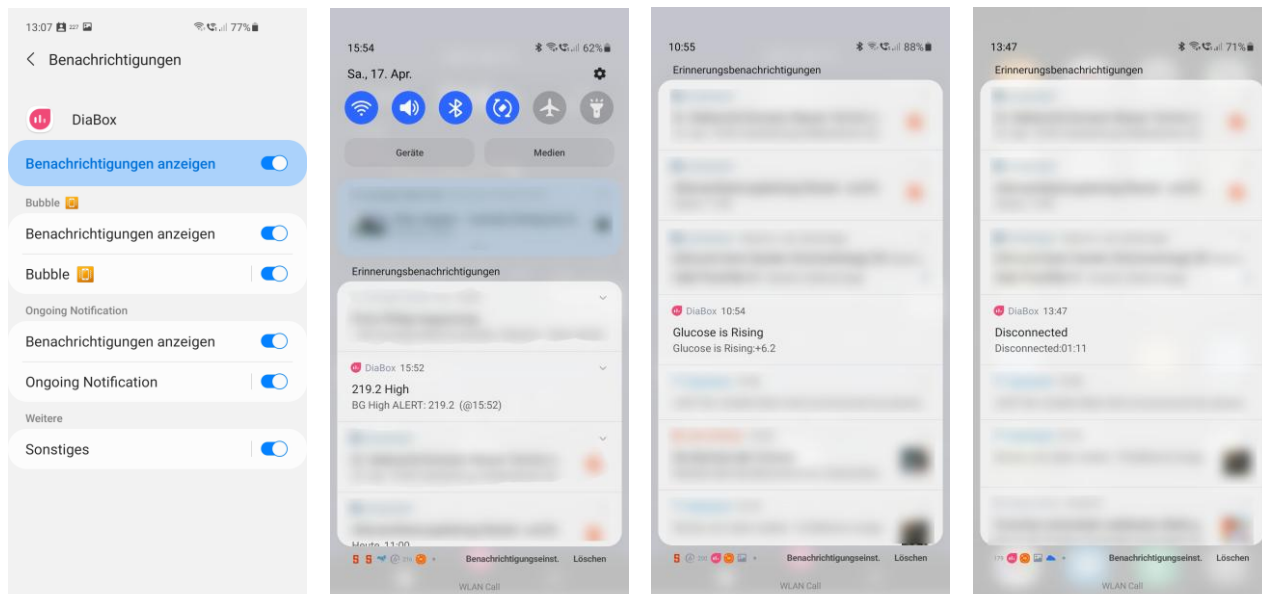
There is a new version of DiaBox, do I have to uninstall the old version or back up any data ?

So far, new updates of DiaBox could be installed over an existing version. Data such as the settings, i.e. also the alarm options, measured value history or calibration points, i.e. the calibration function, remained unchanged.

Note: DiaBox now searches for and informs about available updates.

You can then also download this new version in the app.
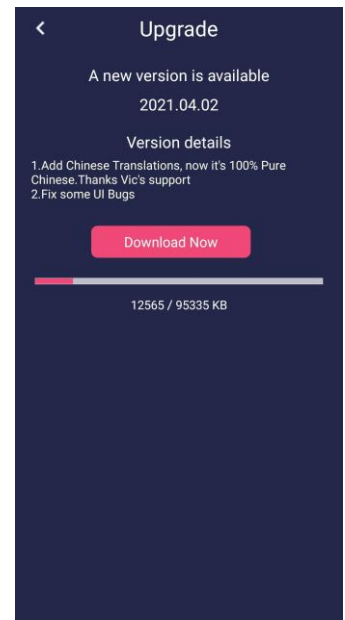
Quellen, Referenzen

[1]	DiaBoxDevTeam	diaboxapp@gmail.com
[2]	DiaBox Facebook Gruppe	https://www.facebook.com/groups/974278412920319
[3]	DiaBox D-A-CH Facebook Gruppe	https://www.facebook.com/groups/DiaBox.d.a.ch
[4]	Eigene Erfahrungen	Freestyle Libre 2 EU Version, DiaBox für Android Wolfgang.Sander@t-online.de

DiaBox Downloads:

[5]	DiaBox for iOS	https://testflight.apple.com/join/DVvR6GTM
[6]	DiaBoxMe for iOS	https://testflight.apple.com/join/Ynoo1pq7
[7]	DiaBox for Android	https://github.com/bubbledevteam/diabox/releases
[8]	DiaBox Translations	https://github.com/bubbledevteam/diabox/tree/master/language

[9]	Abbott	Patientenflyer Alarme ADC-2019-A-0188 Januar 2020
[10]	Abbott	FreeStyle Libre 2 Schulungsbroschüre ADC-2019-DE-1205 August 2019
[11]	Abbott	FreeStyle Libre 2 Benutzerhandbuch ART38828-102 Rev. A 02/19

Version Log

Version	Datum	Autor	Aktion
1.00	04/22/2021	Wolfgang Sander	initial version

Disclaimer

But always note: DiaBox is not an approved medical product, especially not from Abbott and in many places is still in the development stage.

If you base your therapy decisions on it, you are solely responsible for it. Abbott cannot be held responsible or contacted in the event of technical problems.

The author has also described the functionality of DiaBox to the best of his knowledge and belief and is not responsible for any operating errors or malfunctions.