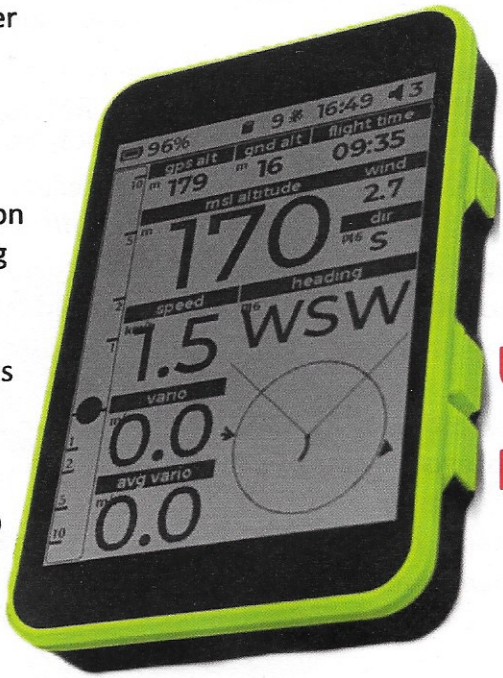
SØ user manual

highlights

instant vario, baro altimeter
all GPS functions
IGC logger
wind speed & direction
thermal assistant
Bluetooth to app connection
automatic screen switching
60 h battery life
USB cable IGC download
custom layouts and widgets



spec

4.2" durable anti-glare LCD
115 x 77 x 16 mm, 150 g
USB-C, SD card
3D printed enclosure

basics for operation

PB = power button
UB = up button
DB = down button
CLICK = button click
PRESS = button press for 1s
PRESS-N = button press & hold for **N seconds**

operation

Vario cannot be powered OFF if it is in flight mode

This is a feature, not a bug. For sure you don't want to accidentally power off vario while flying ;)

power ON = PB PRESS-3, release, then PB CLICK
power OFF = PB PRESS, then PB CLICK, **not possible in flight mode**
screen change = UB/DB CLICK
highlight and list adjustable/toggleable widgets on screen = PB CLICK
adjust highlighted widget on screen = UB/DB CLICK
toggle mode of highlighted widget on screen = PB PRESS
start/stop flight = PB PRESS when the flight time widget is highlighted
sound volume adjust = UB/DB CLICK when the sound icon is highlighted
enter to settings menu = PB PRESS, UB CLICK
enter to layout menu = PB PRESS, DB CLICK
menu item enter = PB CLICK
menu item exit = PB CLICK on „back" item or PB PRESS anywhere
movement in menu = UB/DB CLICK

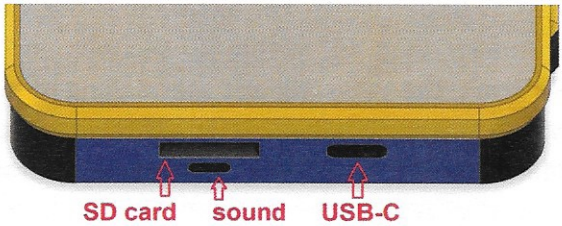
special button actions

reset - press & hold PB + UB for ~5s (PB PRESS-5 & UB PRESS-5)
enter to DFU (programming) mode
Press & hold all buttons for ~5s, then release power button first (PB PRESS-5 & UB PRESS-6 & DB PRESS-6)

SD card

is accessible from the bottom panel of vario. Its holder is push-push type, so push it with a nail or pen to withdraw. Insert card into its slot, **metal contacts facing up** and push it in the same way as for withdrawal. The SD card contains a couple of folders and files.

- IGC files are stored in **igc** folder.
- Terrain data are in **agl** folder.
- Configuration is stored in **cfg** folder.
- Log files used for debug and development are in **log** folder.
- This document is also stored on the SD card inside the vario, so you can click the online links directly and don't **have to type** them manually from the printed sheet supplied with the vario.



Besides the SD card slot, there are two more ports on the bottom of the vario:

- USB-C port for charging and PC connection (not yet implemented).
- Sound channel opening

layout menu

Press and hold the power button (PB) for 2 s to show the side bar, then click the down button (DB) to enter the layout menu.

The first menu entry is **Active Layouts**, where you can select the screens to be used. At least one layout must be selected.

The next entry is **Thermalling Layout**, where you can choose one screen (or none) that the vario will switch to when it detects thermalling.

Switch Parameters contains the threshold values for entering and exiting thermalling mode. **Window** is the moving time range during which the vario compares current changes against the configured thresholds.

On – Min Heading defines the minimum GNSS heading change within the time window required to detect thermalling. **On – Min Avg. Vario** is the lower threshold of average vario for entering thermalling mode. Both conditions must be met simultaneously. Example with default values: if the vario detects at least 180° of heading change within 20 seconds and the average vario is higher than −0.5 m/s, the vario will enter thermalling mode.

The same logic applies to exiting thermalling mode, except that the values are defined as upper limits. For example: if the vario detects a heading change smaller than 45° within 20 seconds and the average vario is below −0.5 m/s, the vario will exit thermalling mode and return to the screen where thermalling was detected. The vario will not exit thermalling mode if you stop turning but continue to climb in straight flight.

The last menu entry is **Display Orientation**, where you can choose between Portrait, Landscape and Reverse Landscape modes. They cycle in order on each PB click.

settings menu

Press and hold the power button (PB) for 2 s to show the side bar, then click the up button (UB) to enter the settings menu.

The first submenu is **Vario**, where you can set:

- **Lift Threshold** defines the minimum vario value at which it starts beeping.

- **Sink Threshold** defines the vario value at which it starts making the sink sound.

- **Sink Mode** can be chosen from several modes. **Off** means the vario is silent during descent, regardless of the values in the audio profile. **Normal** means the vario plays sound according to the audio profile. If the loaded profile produces beeps (rather than a continuous tone) while sinking, the vario will follow that. **Continuous** mode means the vario produces a continuous sound during descent regardless of the audio profile; only the tone frequency is taken from the profile. **Pre-beep** mode produces a short pre-beep before each tone, letting the pilot know there is still sink in case the audio profile would otherwise produce beeps at that part of the range. This function is useful in the range −1 to 0 m/s, when the pilot is still sinking but weak lift is nearby. It is called weak-lift detection.

- **Instant Vario** value defines how much the motion sensors are taken into account in the overall vario calculation. 100% means a fully featured instant vario, very sensitive to any small vertical movement, while 0% means a pure baro-based vario.

- **Actual Vario Time** defines the digital vario integration time. The calculation runs 100 times per second, but it makes no sense to display the vario value at that rate.

- **Average Vario Time** defines the time interval over which the average vario is calculated.

- **Fluid Audio** changes the vario tone frequency even within a single beep. If the checkbox is unchecked, the tone stays at the same frequency, and the tone frequency only changes at the next beep.

- **Glide Min Speed** and **Glide Min Sink** define the minimum speed and sink at which glide mode is activated in the glide/avg widget. We took inspiration from the Xctrack app, where the same

widget shows glide ratio and average vario — since it makes no sense to display a negative glide ratio while climbing, or a negative average vario while gliding down.

- The last entry is **Profile**, where you can choose the audio profile.

The **Flight** submenu contains the values for detecting takeoff and landing.

- **Auto Start Speed** and **Auto Start Change** are two conditions that must both be met simultaneously for takeoff detection. With the default values, the pilot needs to move faster than 10 km/h and the altitude needs to change by more than 5 m (up or down) within a 10-second time window.

- The same logic applies to landing detection: the pilot needs to stay slower than 2 km/h with an altitude change of less than 1 m within a 60-second time period.

The next submenu is **Flightbook**, which contains air time for past periods. This submenu is purely informative; clicking any entry returns you to the main menu. Only **Season Start Date** can be adjusted. By default, we set it to October, following the Xcontest convention.

The last submenu is **System**, where you can set the rest of the parameters.

- **LCD Contrast** is the voltage used to drive the pixels. We recommend leaving it at the default level (10).

- **Auto Power Off** is the time period after which the vario turns off if no button is pressed and the vario is in land mode.

- **UTC Offset** defines the time zone — the shift from UTC time.

- **Bluetooth** toggles the selected telemetry protocol. The MAC address of the BLE module inside the vario is also shown, which is useful when pairing with the phone app.

- **Bluetooth GPS** checkbox enables or disables GNSS coordinate forwarding. We recommend not using this function if the receiver has its own GNSS module (e.g. a phone). Disabling it allows you to create two independent IGC tracklogs from two different sources. If you forward GNSS data, both the vario and the phone use the same data stream, which means both IGCs may be lost if the source fails. Some apps, such as Xctrack, can switch automatically between different sources and sensors based on a defined priority order.

- **Device ID** and **Firmware Build** show information only — there is nothing to set.

- **Diagnostics** screen is also informative; some parameters are shown there.

firmware & configuration update

Firmware flash can be performed when the vario is in DFU (Device Firmware Update) mode while connected via USB cable to a computer (Linux, Mac or Windows) or to an Android device (phone, tablet, etc.). Firmware files can be found in the repository linked below — the file with the highest number is the newest.
vps.skybean.eu/SO_repo/
Download the firmware ELF file with the highest number, along with the matching configuration update ZIP file.
If you want to change other parameters — ones not accessible directly from the vario's layout and settings menus, for example the default screens — you can do it by editing the configuration files. These files are in jsonc format, which can be viewed or edited in any text editor. A tutorial on how to make configuration changes via file editing is provided in a separate document.

firmware flash via computer

- Withdraw the SD card from the vario, delete the cfg folder and copy the new cfg folder from the downloaded ZIP file.
- Download and install the STM32CUBE Programmer app (Linux, Mac, Win32, Win64) from its product page here.

www.st.com/en/development-tools/stm32cubeprog.html

- Watch a video on how to update your vario:

youtu.be/UMh098ibdug

firmware flash via Android device

Download, install and use the **StmDfuUsb** app from Google Play.
play.google.com/store/apps/details?id=com.yatrim.stmdfuusb
You can find more detailed and up-to-date info on our product page here
vps.skybean.eu/SO_vario

other information

A more detailed user manual is available here:

vps.skybean.eu/manuals/

email: info@skybean.eu

skybean.eu

instagram.com/skybean_vario

youtube.com/c/SkyBeanVarios

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