LARUS Vario Display

Installation and Operation Manual

Version v0.3.9.0

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About This Document

This manual describes the LARUS Vario Display, which is manufactured by SteFly can be obtained. Other devices from this manufacturer are also referenced in this manual. The software for the Vario Display is available under an open source licence and can be used on various devices. The Vario Display is a device that displays data from various sensors. It is designed for use in the Vario.i software.

Software Licence Agreement

This software is released under the GNU General Public Licence Version 3. The full text of the licence and the disclaimer can be found on this page: gnu.org.

Disclaimer (Vario Display Software)

This product and all associated files, data and materials are provided ”as is” and without any express or implied warranty. Use of this product is at the user’s own risk. Although the utmost care was taken during development to eliminate errors, no guarantee of error-free operation is provided. No claims are made regarding its accuracy, reliability or suitability for any particular purpose. The developers and contributors to the Larus project are not liable for any errors contained herein or for incidental or consequential damages, loss of data or personal injury in connection with the provision, performance or use of this material.

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1 General Information

1.1 Preliminary Remarks

1.1.1 Important Information

Before using the system or any part of the system, please read these instructions carefully and familiarise yourself with them.

1.1.2 Conventions and Definitions of Pictograms

The safety instructions are the result of risk assessments and hazard analyses. The following symbols are used in this document: * W: Warning

Please observe the important notes marked with a yellow warning symbol, as failure to do so may result in damage or other critical situations. Please observe the important notes marked with a yellow warning symbol, as failure to do so may result in damage or other critical situations.

A blue cloud indicates useful information or tips.

1.2 Safety

1.2.1 Safety precautions

Duty to provide information: Every person involved in the installation or operation of LARUS components must read and observe the safety-related sections of these operating instructions.

1.2.2 Proper Use

The LARUS Vario Display visualises data that is measured and calculated by the LARUS sensor unit. LARUS was developed to quickly and reliably calculate the direction and strength of thermals and wind. To do this, the sensor unit combines data from high-precision sensors and GNSS receivers in sophisticated algorithms. The LARUS Vario Display is installed in the instrument panel. The LARUS sensor unit provides glider pilots with accurate information about wind, vertical air movements and the flight attitude of the glider. Its use is limited to daytime VFR conditions. Safety decisions must be made independently of the installation and operation of LARUS components .

1.2.3 Improper Use

In the event of improper use, all liability and warranty claims shall lapse. Improper use shall be deemed to be any use that deviates from the above-mentioned purposes, in particular:

- The use of LARUS data under non-VFR conditions or at night is prohibited. LARUS is not certified for this purpose. Although LARUS provides AHRS data to XCSoar, you should not rely on

the artificial horizon display.

- Use of LARUS data during aerobatics or under flight conditions with high angle of attack (stall) or high G-forces. The algorithm was designed for normal flight conditions.
- Operation of the LARUS Vario Display outside the conditions defined in the technical data, e.g. high or low supply voltage, excessive temperatures or humidity.

2 Installation

2.1 Scope of Delivery

- LARUS Vario Display
- fastening screws
- 1:1 standard RJ45 cable
- Micro SD card with adapter
- D-Sub 9 solder plug and housing
- 1.5 mm hex key for fitting the rotary knobs

2.2 Quick Start Guide

In some cases, the default settings can be used and the device can be put into operation in a simplified manner. In this case, it is sufficient to observe the following points:

1. Please remove both rotary knobs using a 1.5 mm hex key (included in the scope of delivery).
2. Secure the LARUS Vario display with three screws in a 57 mm recess in the instrument panel. It can also be mounted at angles of 90°, 180° and 270°.
3. Fit both rotary knobs
4. Connect the CAN port of the LARUS Vario display and the LARUS sensor unit using the 1:1 patch cable included in the scope of delivery.
5. Switch on LARUS.
6. Check whether the satellite icon on the screen is yellow or green and the current course direction is displayed.
7. Select a suitable polar for your glider or create one.
8. Your LARUS Vario display is now ready for flight.

2.3 Design and Function

The LARUS Vario Display shows the data measured and calculated by LARUS. LARUS is an advanced variometer with real-time wind measurement capability. It features state-of-the-art pressure sensors, an advanced IMU and GNSS receivers to capture accurate flight data. The key features of the display are:

- Round display for 57 mm standard instrument panel cut-outs
- Brighter and more colourful screen

- Lightweight, compact design with black anodised aluminium housing
- Rotary knob with two levels and push-button function for changing settings and accessing menus 1.5 mm hex key.

The LARUS Vario Display is developed and continuously improved by Prof. Dr. Klaus Schaefer, Maximilian Betz, Winfried Simon, Peter Simon and the SteFly team. You are welcome to participate in the development and contribute suggestions for improvement or problems.

github.com/larus-breeze

2.4 System Configurations

2.4.1 Configuration in the Single-Seater

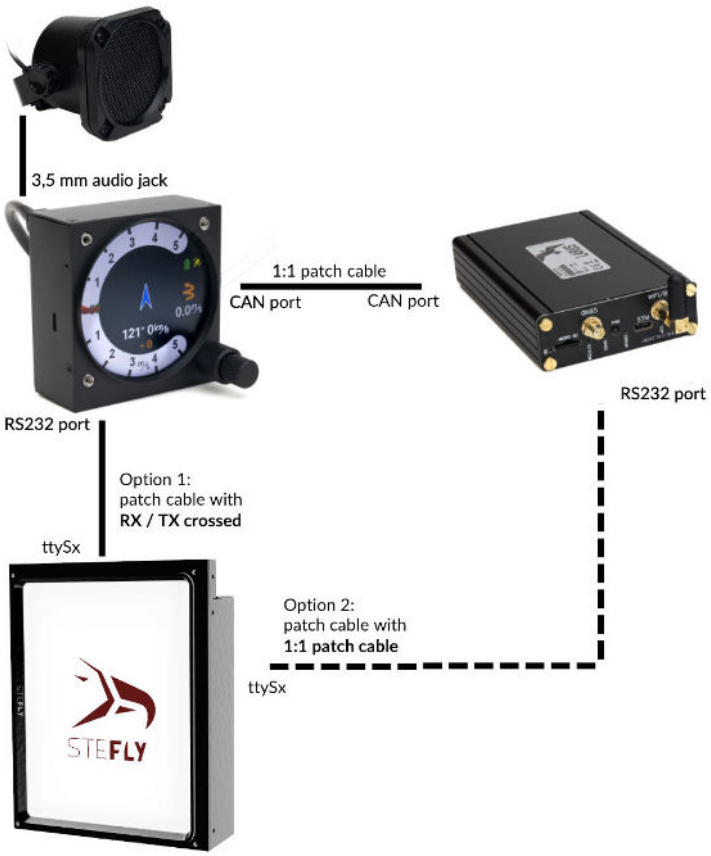


Figure 1: Connection Diagram for Single-Seater Configuration

The navigation computer is connected to the LARUS Vario display (Option 1). This is often the simplest option. Alternatively, the navigation computer can also be connected to the LARUS sensor unit (Option 2).

2.4.2 Configuration in the Two-Seater

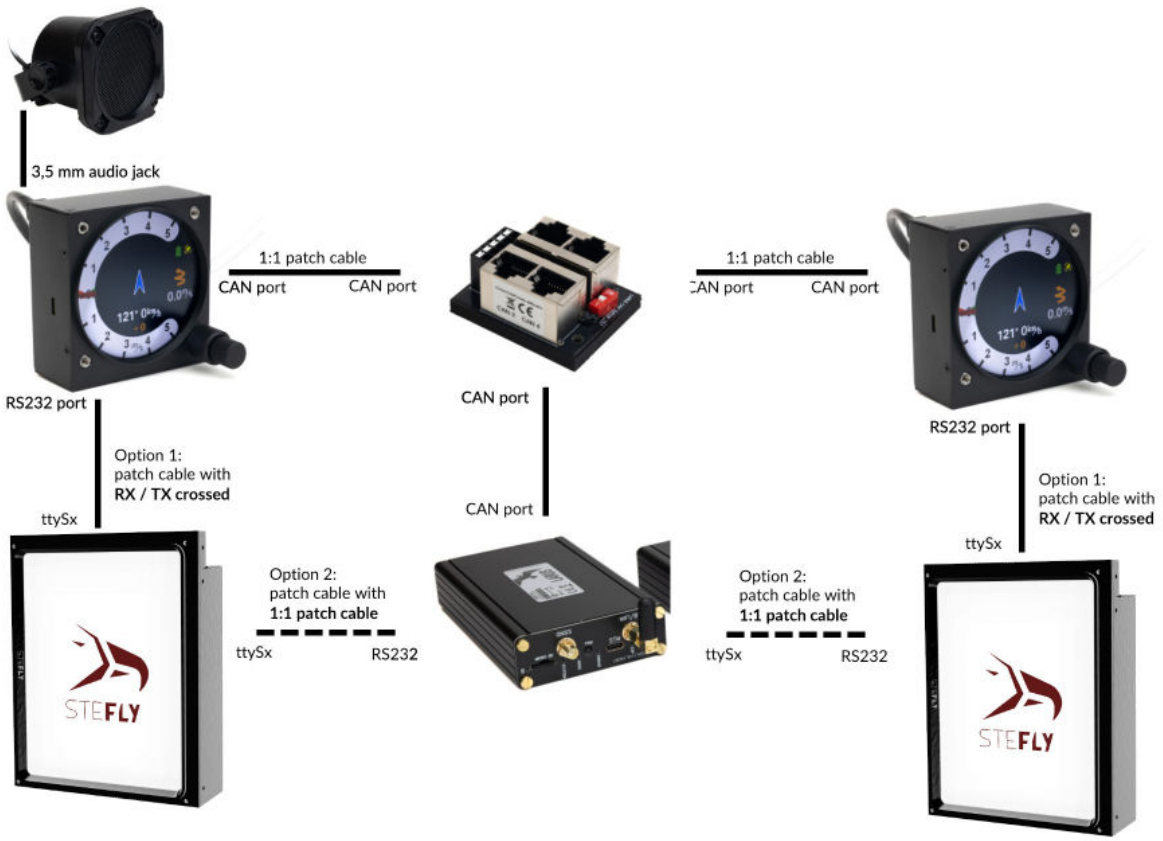


Figure 2: Connection Diagram for Two-Seater Configuration

In two-seaters, the navigation computers are typically connected to the LARUS Vario displays. However, it is also possible to connect the navigation computers to the LARUS sensor unit. The data is exchanged between the LARUS components and distributed to the navigation computers so that no information is lost. The LARUS sensor unit is connected to the LARUS Vario displays and the LARUS navigation computers.

2.5 Connectors and Cabling

2.5.1 Connector on the Rear of the Device

Figure 3: View from the Rear of the Device

The connections for CAN, RS232 and the inputs/outputs are located on the rear of the LARUS Vario display. The slot for inserting the SD card and the 3.5 mm audio output jack are also located there. The LARUS Vario display is equipped with a 4.3-inch colour touchscreen.

2.5.2 CAN and RS232 Connections

Figure 4: The RJ45 Connectors in Detail

Pin	CAN	RS232
1	GND (internally connected)	GND (internally connected)
2	GND (internally connected)	GND (internally connected)
3	NC	RS232-1-RX
4	CAN Low	RS232-1-TX
5	CAN High	NC
6	NC	NC
7	VCC [9-28V DC]	VCC [9-28V DC]
8	VCC [9-28V DC]	VCC [9-28V DC]

Table 1: CAN and RS232 RJ45 Pin Assignment

2.5.3 GPIO / D-SUB 9

Several additional switches, sensors and devices can be connected via the D-Sub connector. The following diagram shows the view into the connector of the LARUS Vario display.

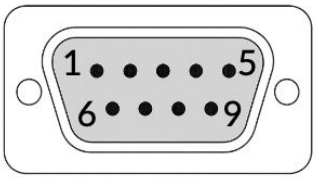


Figure 5: DSUB-9 Connector

Pin	CAN	RS232
1	GND	(Ground)
2	DI3 - Gear	Input
3	DI1 - Water Ballast	Input
4	DO2	Output
5	GND	(Ground)
6	DI4 - Speed Breakes	Input
7	DI2 - Spped to fly	Input
8	GND	(Ground)
9	DO1 - Canopy Flasher	Output

Table 2: Pin Assignment GPIO / D-SUB 9

To make it easier to identify the pins, these numbers are also stamped into the socket (included in the scope of delivery). After wiring, the settings must be made in the LARUS Vario display .

2.5.4 Audio

An audio jack is available for connecting a speaker with a 3.5 mm jack plug. The internal resistance of the speaker must be between 4 and 8 ohms (max. output of 3 W at 8 ohms).

A single loudspeaker must not be connected to more than one device.

2.5.5 SD Card

The device has an SD card slot for firmware updates.

As SD card extensions can damage the LARUS Vario display, we accept no liability for damage caused by their use .

2.5.6 Cabling

When a serial connection (RS232) is established between SteFly NAV and LARUS Vario Display, the MC value settings, for example, are synchronised/transferred between the devices. In addition, the LARUS Vario Display processes inputs from a speed-to-fly/vario switch that is directly connected to the SteFly remote control lever. The following steps are required:

- Connect devices with cables:
  - The CAN port of the LARUS sensor unit must be connected to the CAN port of the LARUS VARIO display using a 1:1 patch cable (for two-seater configurations, use the cable box). The CAN port of the LARUS sensor unit must be connected to the CAN port of the LARUS VARIO display using a 1:1 patch cable (for two-seater configurations, use the cable box). The CAN port of the LARUS sensor unit must be connected to the CAN port of the LARUS VARIO display using a 1:1 patch cable (for two-seater configurations, use the cable box).
  - The devices on which XCSoar runs can be connected via a crossed patch cable RX/TX between the RS232 port of the vario display and the ttySx port of the SteFly NAV.
- Optionally, connect switches for detecting the discharge process of the water ballast and the landing gear warning to the corresponding DSUB-9 pin and any GND pin. For the warning signal (landing gear), you have the option of using two separate, directly connected switches for the warning signal (landing gear) and the warning signal (airbrakes) (recommended) or a cable with the two switches connected in series to the DSUB-9 connection.
- The SteFly remote control stick can be connected in two different ways: :
  - Depending on the equipment: with a separate cable to DSUB-9 pin 7
  - Using the USB cable (always available)
- Please adjust the settings in XCSoar (version 7.44 or higher) / OpenSoar (7.43 or higher):
  - If the Vario display is connected directly to the SteFly NAV, please select the appropriate ttyS port, baud rate 38400, Larus driver, and enable synchronisation (option) with the device.
- Please adjust the settings in the LARUS Vario display for the connected optional switches.
  - Warning regarding landing gear
  - water ballast
  - speed to fly configuration Switchover (if not switched automatically)
    - Input pin: To use an external switch (on the control stick, flap lever, etc.), set the Vario control to ”Input pin” and select the correct setting in the StF pin configuration. (active: when open/closed)
    - NMEA for SteFly remote control stick. In addition to the settings in Vario, you must install an event definition file in XCSoar/OpenSoar (Configuration / System / View / Language, Input / Events – activate Expert , click on Events – Download – GLB-XCI-xcremote-XCNAV.xci). Exit the XCSoar configuration and restart XCSoar.

2.6 CAN Termination

The LARUS Vario display and the LARUS sensor unit are connected to each other via the CAN bus. CAN bus networks require terminating resistors at each end of the network. Therefore, all devices have an integrated switch for activating the resistor:

Figure 6: Switches on the Devices for Terminating the CAN Bus

Description	Display front	Larus Box	CAN Splitter	Display rear
single-seater	on	on	-	-
Two-seater, Larus box in the front panel	off	on	off	on
Two-seater, Larus box in the rear wall	on	on	off	off

Table 3: CAN Termination Single/Two-Seater

Please note: All LARUS sensor units delivered before March 2025 do not have a CAN termination switch. The CAN termination resistors are always activated by default. Please note: All LARUS sensor units delivered before March 2025 do not have a CAN termination switch. The CAN termination resistors are always activated by default.

2.7 External Backup

The LARUS Vario Display is usually powered via a patch cable between the CAN connections of LARUS. LARUS must be protected by an external fuse (500 mA to max. 3 A), as is standard practice for all electrical devices in aviation. If LARUS draws its power from another main instrument (e.g. SteFly NAV via D-sub connector), please ensure that the main instrument is protected by an external fuse accordingly.

2.8 Installation Site

The following image shows a typical installation of the LARUS Vario display in the instrument panel of a glider.

Figure 7: Installation Situation in the Instrument Panel

The display fits into a standard 57 mm recess and is secured with three M3 screws.

Figure 8: Fasteners

For installation, it is necessary to remove the two rotary knobs with a 1.5 mm hex key.

2.9 Installation Orientation

The display can be mounted in the following orientations: 0° / 90° / 180° / 270°. After mounting the display, its orientation may need to be adjusted in the ”Display Rotation” menu.

If you intend to replace an existing device with the LARUS Vario Display, please check the desired installation position before drilling the 7.3 mm hole for the rotary encoder, as the display housing is slightly asymmetrical.

2.10 Initial Commissioning and Functional Test

To start up the device, please follow these steps:

1. Please check that the LARUS Vario display is connected as shown in the drawings, chapter System Configurations.
2. Switch on LARUS
3. Please check whether LARUS Vario Displays starts up and a yellow or green satellite icon is displayed. The Vario pointers should move slightly around the zero position.
4. Now you should configure the device. All setting options are documented in detail in chapter Settings.

2.11 Maintenance

The entire system contains no parts requiring maintenance. To claim warranty services, please contact SteFly directly.

Opening the housing of the LARUS Vario display will void the warranty.

2.12 Firmware Update

The LARUS team continuously improves the software and releases firmware updates. To update the firmware, proceed as follows:

1. Switch off the device.
2. Save the new *.bin file to the SD card included in the scope of delivery and insert it into the SD card slot on the back of the LARUS Vario display.
3. Switch on the device.
4. If firmware is detected on the SD card, the display will remain black for approximately 3-5 seconds before the following message is displayed: Installing... Do NOT power off device.
5. The device will restart automatically. During the first 10 seconds, the firmware version will be displayed in the Info1 area. The device will then display the default screen.

The LARUS Vario Display only installs compatible firmware versions. If several firmware versions are stored on the card, the latest one will be installed.

If the installation fails, please repeat the process. If the installation fails again, please use a different SD card. The SD card must be at least 4 GB in size (type SDHC) and formatted with FAT32. The format must be compatible with DOS/Windows 95 (not GPT).

3 Operation

3.1 Operation

Figure 9: LARUS Vario Display

The device has a rotary knob with two levels and a push button. The following functions are assigned to the button and the two rotary knobs:

- Turn the small/upper knob: Volume control
- Turn the large/lower knob: MacCready value
- Briefly press the rotary knob: Flight Menu
- Press and hold the rotary knob: Settings

The device provides three basic displays: Vario, Horizon and Device Information. You can switch between the displays by briefly pressing the button and selecting the Display item in the menu. The selected display remains permanently. The following sections describe the different display modes.

3.2 Vario Display

The central display distinguishes between the circling mode and the straight flight mode . If a rotational speed of at least 1°/sec is measured for more than 10 seconds, thecircling mode is activated. If the rotational speed falls below this value for more than 10 seconds, the display reverts to the straight flight mode .

The change from variometer mode to speed to fly mode is independent of the change in the central display information.

3.2.1 Circling Mode

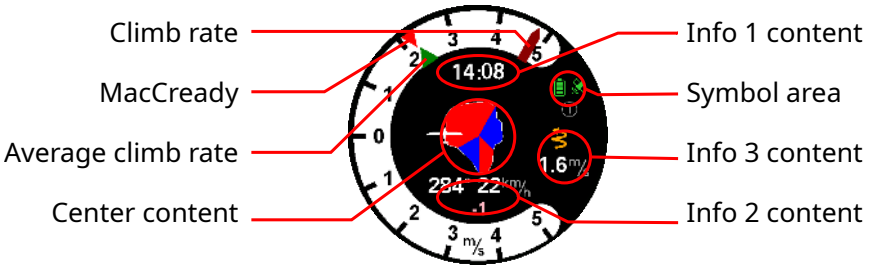


Figure 10: Advertisement in Circling Mode

The displays Info 1, Info 2, Info 3 and the central display depend on whether you are flying straight ahead or in a circle. The content of these displays can be set for both modes.

Contents of the circling mode :

- News climb rate
- Average climb rate
- MacCready value
- Central display, here thermal assistant
- Info 1 display, here time
- Info 2 display, here wind direction and wind strength
- Info 3 Display, here average climb rate since the start of circling
- Symbol area: The colour of the Sat symbol indicates the data quality:
  - Green: Connection to LARUS sensor unit established. Device has GPS fix.
  - Yellow: Connection to LARUS sensor unit established, unit has no GPS fix
  - Red: No connection to the LARUS sensor unit
- Symbol area: The colour of the battery symbol corresponds to the operating voltage:
  - Green: The battery voltage is sufficient.
  - Yellow: The battery voltage is in the critical range.
  - Red: The battery voltage is below the minimum value.
- Symbol area: Circle: Usage Mode Club, User Profile 1 (Usage Mode Normal as square)

3.2.2 Straight Flight Mode

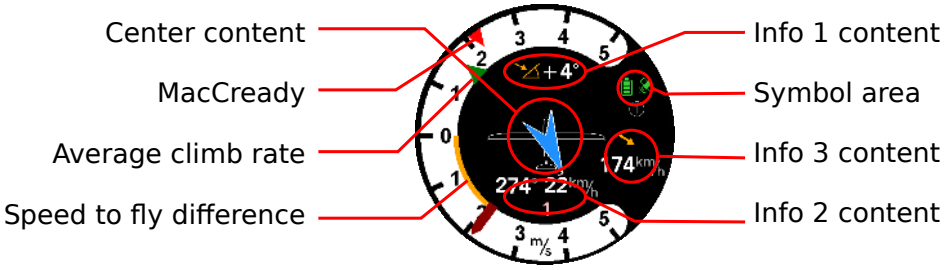


Figure 11: Advertisement in Straight Flight Mode

Contents of the straight flight mode :

- Central display, here wind direction relative to the aircraft's longitudinal axis
- Average climb rate
- MacCready value
- speed to fly Sensor: The position of the band indicates whether you are flying too fast or too slow. Positive values mean that you are flying too fast, negative values mean that you are flying too slow. The length of the band indicates by how much. 1 m/s corresponds to 10 km/h.
- Symbol area: Battery symbol OK, Sat symbol OK, Usage Mode Club, User Profile 1
- Info 1 display, here angle wind offset
- Info 2 display, here wind direction and wind strength
- Info 3 Display, here speed to fly

3.2.3 Available Central Displays

Central Displays in the Circling Mode

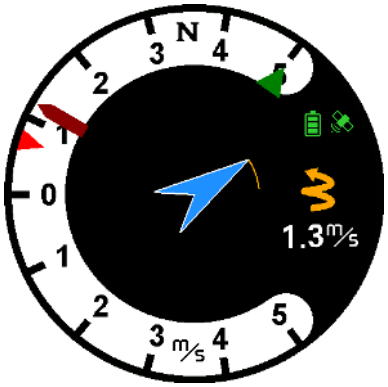


Figure 12: Wind Indicator with an Arrow and Flag

The current wind direction is indicated by a central arrow. The size of the arrow is proportional to the wind speed. Changes in wind direction relative to the average direction are indicated by a wind vane, while changes in wind speed relative to the medium-term average speed are indicated by the width of the wind vane. The arrow direction refers to north, symbolised by the N on the scale above.

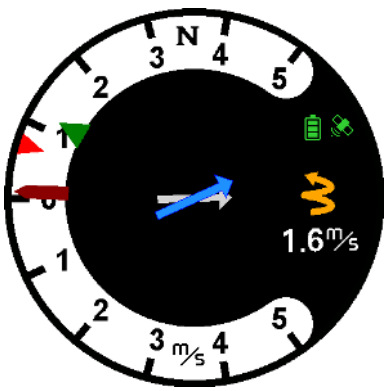


Figure 13: Wind Indicator with Two Arrows

The current wind direction and speed are indicated by the blue arrow, information about the average wind is shown by the grey arrow in the background. The size of the arrow depends on the wind speed. The direction of the arrow refers to north.

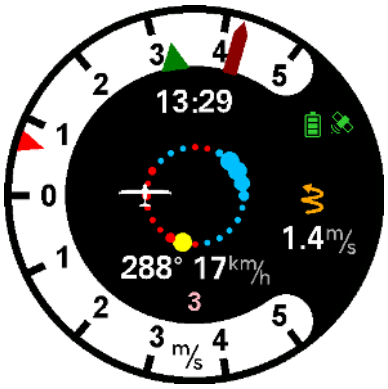


Figure 14: Centring Aid with Dots

climb rate climb rate The Thermic Assistant can help pilots centre the thermals. It clearly shows where good and less good thermals can be found. This information is particularly useful as the LARUS system displays the thermals without delay.

Meaning of the colours of the circle points:

- Yellow: Maximum of the climb rate
- Red: The climb rate is above average
- Blue: The climb rate is below average.

The diameter of the dots is proportional to the rate of climb. A constant updraft is optimally centred when blue and red dots occur with approximately equal frequency.

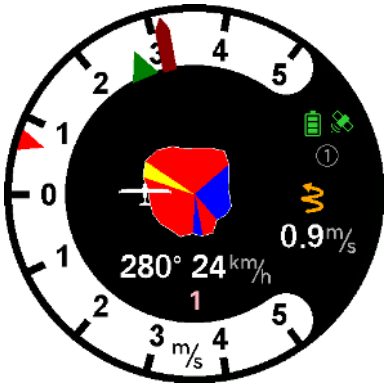


Figure 15: Centring Aid with Spider Web

Meaning of the colours of the circle points:

- Yellow: Maximum of the climb rate
- Red: The climb rate is above average
- Blue: The climb rate is below average.

The diameter of the segment is proportional to the rate of climb. A constant updraft is optimally centred when blue and red areas appear with equal frequency.

Central Displays in the Straight Flight Mode

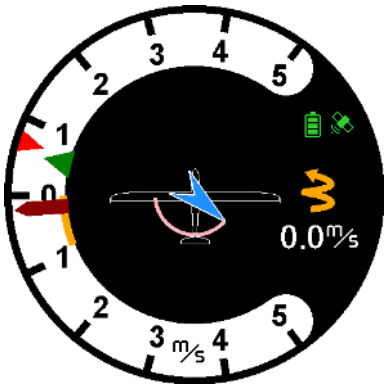


Figure 16: Wind Indicator for Straight Flight with an Arrow and Flag

The current wind direction is indicated by a central arrow. The size of the arrow is proportional to the wind speed. Changes in wind direction relative to the average direction are indicated by a wind vane, while changes in wind speed relative to the medium-term average speed are indicated by the width of the wind vane. The aircraft symbol indicates that the display refers to the flight direction.

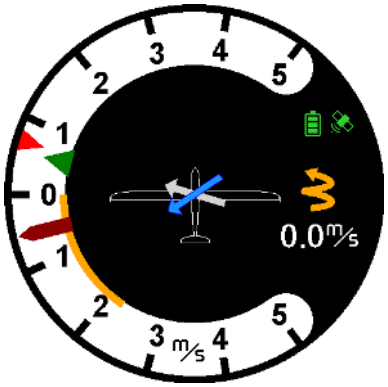


Figure 17: Wind Indicator in Straight Flight with Two Arrows

The current wind direction and speed are indicated by the blue arrow, while information about the average wind is shown by the grey arrow in the background. The size of the arrows depends on the wind speed. The direction of the arrows refers to the longitudinal axis of the glider. The glider symbol indicates that the display refers to the direction of flight.

3.3 Artificial Horizon

This is not an officially approved artificial horizon. Therefore, this display must not be used for flying in clouds or otherwise outside of VFR conditions.

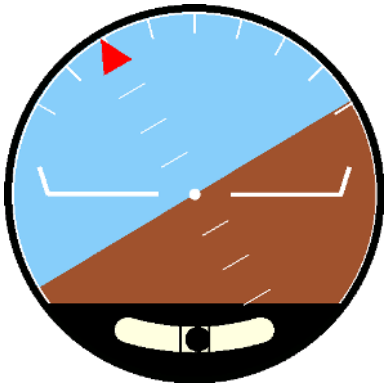


Figure 18: Artificial Horizon

The artificial horizon display contains the following information:

- The blue area represents the sky.
- The boundary to the brown area corresponds to the horizon.
- The circular scale at the top shows the current bank angle of the glider in 15° increments (here approximately 30°, red arrowhead). The horizontal axis shows the airspeed in metres per second, and the vertical axis shows the altitude in metres.
- The scale parallel to the horizon represents the climb/descent angle in 10° increments (here 0°).
- inclinometer s can be seen in the lower section, which reveal any shifting. .

The glider is currently in a clean right turn with a bank angle of 30°.

In some competitions, the display of the artificial horizon is prohibited. Therefore, the output of horizon information can be blocked in the LARUS sensor unit . In this case, a warning is issued instead of the horizon .

3.4 Device Information

The device information display mode shows file information about the LARUS Vario display and the LARUS sensor unit. This display can be helpful for performing error analyses or retrieving specific information. For example, all statuses of the inputs and outputs can be viewed here. Error statuses of the LARUS sensor unit can also be identified.

Figure 19: Device Information

3.5 Flight Menu

The Flight Menu provides adjustment options that are required before or during flight. The menu can be accessed by briefly pressing the control button. The headings in this section are named as they appear in the device.

3.5.1 Water Ballast

This is where the amount of water ballast to be taken on board is specified. When draining the water during flight, this value can be corrected manually or reduced automatically by means of a switch on the valve and the corresponding configuration.

The set value is synchronised with a connected navigation computer.

3.5.2 Bugs

Insects on the wings and fuselage reduce the gliding performance of the glider. These changes in the performance of a glider can be approximated with this setting. Values from 0 to 50 percent are possible. At a setting of 50 percent, the sink rate doubles at a given speed.

The algorithm works exactly the same as XCSoar / OpenSoar. The set value is synchronised to a connected navigation computer.

3.5.3 Pilot Weight

The pilot’s weight is taken into account when calculating the glider’s polar . For two-seaters, the combined weight of both pilots must be entered here

The set value is synchronised with a connected navigation computer.

3.5.4 Display

The Display menu item allows you to select the permanent display of the device. Here you can switch between Vario, Horizon and Device Information.

3.5.5 User Profile

The LARUS Vario Display offers many settings to adapt the displays to the pilot's needs. If several pilots fly a glider, the User Profiles Convenient switching between the different settings. Up to four different profiles can be used.

As described in the Usage Mode section, whether three or four usage profiles are available depends on the activated mode. Some settings are synchronised across all four usage profiles Some settings are synchronised in all four usage profiles, as they depend on the glider and the installation situation. This applies, for example, to the glider'spolar and hardware pin configurations. This ensures that these settings are available in all profiles: Usage Mode, Code.

4 Settings

The functions stored here are used to configure the system. The headings correspond to those in the English texts in the LARUS Vario Display menus to make them easier to find .

4.1 Views

4.1.1 Circling, Straight

These two menu items determine what is displayed during straight flight and what is displayed during circular flight. The switch between circular flight and straight flight is automatic.

The following views can be defined in each case, see also Vario Display:

- **Center Content:** centre display
- **Info 1 Content:** Top line
- **Info 2 Content:** Bottom line
- **Info 3 Content:** Right margin

4.1.2 Units

Various representations of the display are made using a unit of measurement. Here, you can specify which units of measurement are to be used:

- **Horizontal Speed:** Unit of measurement for horizontal velocity
- **Vertical Speed:** Unit of measurement for vertical velocity
- **Height:** Unit of measurement for altitude display

4.1.3 Energy Arrow

The energy arrow is intended to show the direction in which increasing wind speed is likely to occur. It displays the vectorial difference between the current and average measured wind speeds. climb rate

4.1.4 Display Rotation

The display can be installed at different angles (0°, 90°, 180° or 270°). The display can be adjusted to suit the installation situation.

4.1.5 Glider Symbol

When flying straight ahead, the wind indicator refers to the longitudinal axis of the aircraft. This can be symbolised by displaying the floor plan of a glider. The symbolism can be activated or deactivated.

4.2 Advanced

4.2.1 User Profiles

Usage Mode, Code

The LARUS Vario Display's settings allow for individual configurations according to the pilot's needs. These options and freedoms are desirable on the one hand, but problematic on the other. In club operations, it is therefore not uncommon for irritation to arise when a pilot encounters a device with an unfamiliar configuration. For this reason, the LARUS Vario Display supports two modes: Normal and Club.

In Normal mode (factory setting), all settings can be made as desired. Four user profiles (0..3) are available in this mode. This allows up to four pilots to permanently use different settings.

In Club mode, two conflicting objectives are pursued. On the one hand, pilots should not be deprived of useful settings, but on the other hand, standardised settings should be available. To achieve this, profile 0 is locked. This profile serves as a template for the standardised settings. Profiles 1, 2 and 3 can be used as usual. However, some configuration items, such as settings for the polar , assignment of hardware pins or access to the sensor unit, are excluded. Profile 1 is reset to the default values and activated on each new day of flying. In the menu item User Profile There is also a function for resetting the selected profile to the default values if required.

Switching between the Usage Modes is secured by a code. The code is derived from the firmware version. Firmware v0.3.8.56 expects the code 3856.

Config Reset

This function can be used to reset the currently selected user profile to the default values. All settings relating to the displayed data will be reset. Settings relating to the aircraft or hardware will remain unchanged.

Factory Reset

This resets the device to its factory settings. This affects all settings for all profiles.

4.2.2 Vario

Avg Climb Source, TC Climb Source

Two different sources are supported for determining the mean climb rate . The differences are as follows **Avg Climb Source:**

- **Frontend:** The average value is calculated during circling. When switching from speed to fly to Vario, the current vario value is used as the starting value. When switching from Vario to speed to fly , the averaging is paused and the display remains constant. The time constant for calculating the average value can be adjusted: **TC Climb Source**.
- **Sensorbox:** The averaging is performed continuously. During straight flight, the averaging is performed with a fixed time constant, which can be set in the sensor box menu. During circling, the averaging is performed synchronously with the circling.

Vario Upper Limit, Vario Lower Limit

The acoustic signal is muted between these two values.

4.2.3 Speed to Flyy

TC Circle Hyst

The hysteresis, i.e. the waiting time when switching between Vario and speed to fly , is set here. The hysteresis is the time between the last Vario and the first .

TC Speet to Fly

The display of the speed to fly is dampened so as not to irritate the pilot with a nervous display. Here, you can specify the time constant with which this dampening should take place.

Vario Control, StF Pin Config

The LARUS Vario Display supports various methods for switching between the Vario andspeed to fly displays. The following options are available:

- **Auto:** The switchover depends on the airspeed. The limit is 1.1 times the speed for the best glide ratio. When determining the limit, the aircraft polar curve and the load (pilot weight, water ballast) are taken into account. During circling, there is no switchback to vario.
- **Input Pin:** The switchover is triggered by a switch or pushbutton (selectable) . The hardware configuration must also be configured (switch/pushbutton and polarity) **StF Pin Config**.
- **NMEA:** The switchover is triggered by XCSoar/OpenSoar. This setting can also be used if a joystick remote control for XCSoar/OpenSoar with speed to fly button is used.
- **CAN:** In two-seater installations, it may be desirable for the speed to fly /Vario switchover to be triggered by the second display device. If this second device performs the switchover automatically, for example, this ensures that both displays operate synchronously.

Stf Upper Limit, Stf Lower Limit

You can set a speed range in which the acoustic speed to fly signal is muted. In the factory setting, the audio signal is deactivated in a range of +/- 10 km/h. This range can be adjusted here to suit

individual preferences.

4.2.4 Gear Alarm

The landing gear warning is designed to remind the pilot to extend the landing gear if he forgets to do so before landing. The landing gear warning is based on two switches that monitor the air-brakes andlanding gear . The warning is both visual on the display and audible. The switches can be connected directly to the LARAUS Vario display or in series via a signal cable.

Direct connection of both switches to the LARUS Vario display: Both pins must be set up correctly : **Gear Pin Config**, **Airbrakes Pin Config**. **Gear Alarm Config** must then be set to: **Two Pin Mode**.

Connections from the switches in series: The common line is set up: **GearPinConfig**. **Gear Alarm Config** must then be set to: **One Pin Mode**.

Alarm Volume allows you to adjust the volume of an alarm.

4.2.5 Drain Control

The switch that monitors the water drainage device is set up: **Drain Pin Config**.

A constant flow rate is assumed, which must be specified: **Flow**.

4.2.6 More Settings

This section summarises the following settings:

- **Battery Good:** Above the limit value set here, the power supply is OK (green battery symbol).
- **Battery Low:** Below the voltage specified here, the battery symbol is displayed in red. If the voltage is between the two values, the battery symbol is displayed in orange.
- **Flash Control:** The LARUS Vario Display is capable of controlling a canopy flasher , which can be configured here.

4.2.7 Center Frequency

Here you can set the centre frequency of the variometer.

4.3 Polar Settings

To obtain the correct speed to fly information, you must set the correct polar values for your glider type. The LARUS Vario display comes factory-equipped with more than 200polar s from various gliders.

If you cannot find your glider type in the list, you can select any glider polar curve and change the individual settings to the values of your glider polar curve.

4.3.1 Glider

Select the correct or closest aircraft type (polar). The name of the aircraft type cannot be changed.

Selecting an aircraft type overrides all subsequent settings such as empty weight, maximum water ballast, etc. This cannot be reversed, even if the identical type is selected again later. All specific values must then be re-entered.

4.3.2 Empty Mass

After selecting the glider type, you should adjust the empty weight (without the pilot's weight) of your glider so that the calculations can be performed correctly.

4.3.3 Max Ballast

Ensure that the maximum water ballast matches the specifications of XCSoar/OpenSoar, otherwise the water ballast calibration will not function correctly.

4.3.4 Reference Weight

The sink rates specified below for the polar refer to a glider with the reference mass specified here.

4.3.5 Polar v1, v2, v3, si1, si2, si3

The speeds and sink rates describe the performance of the glider used. Thepolar is represented as usual by a quadratic equation. The speed range in which the glider flies between updrafts is important so that the speed to fly can be calculated correctly .

4.4 Sensor Box

4.4.1 Calibration of the LARUS Sensor Unit

Before you begin your first flight, the position sensors of the LARUS sensor unit must be precisely adjusted. The calibration steps are carried out using a simple procedure, which is described below and initiated via functions in the LARUS Vario display. The calibration is carried out in two stages.

4.4.2 Initial Calibration on the Ground:

Assemble your glider and place it on a flat surface. After you have taken up the individual positions, wait until there are no more vibrations in the aircraft before continuing with the calibration. Do not use a tail trolley to fix the vertical axis of your glider during the following procedures.

- **Left Wing Down:** Put down the left wing, wait a moment, and call up the function.
- **Right Wing Down:** Put down the right wing, wait a moment, and then activate the function.
- **Wings Straight:** Hold the wing horizontally, wait, call up the function.
- **Calc Orientation:** For this step, it is important to complete all three of the previously mentioned steps. The order of the steps does not matter, but they must be completed in full.

4.4.3 Fine Adjustment in the Air:

The exact pitch angle calibration is performed during flight. It is recommended that this step be performed in a flight that is not disturbed by thermal gusts. Align your glider at the speed with the best glide ratio (if you have flaps , set it to this speed). Call up **Straight Flight** That's it. You're done. You can check the calibration by switching to the artificial horizon display. (Artificial Horizon).

4.4.4 Reset Sensorbox

This function triggers a restart of the sensor box.

4.4.5 Init Settings

These setting options for the LARUS sensor unit are reserved for experts and will not be described in detail here.

Appendix

A Troubleshooting

problem	Possible causes	solution
The LARUS Vario Display starts up, but the satellite icon is red and the vario pointers are fixed.	Connection to the LARUS CAN port using a crossed Rx/Tx patch cable instead of a standard 1:1 patch cable.	Please replace the patch cable and use the cable included in the delivery.
The LARUS Vario Display starts up, but the satellite icon is red and the vario pointers are fixed.	The LARUS Vario display has been connected to the wrong connector (RS232).	Please connect the CAN ports.
The satellite pictogram is constantly or frequently yellow, and the vario and/or wind values are not plausible.	Poor GNSS reception	Ensure that the GNSS antenna is positioned upwards without any (metallic) shielding.
Variable and/or wind values are permanently or temporarily implausible.	The LARUS sensor unit is disrupted by magnetic influences.	Do not place the LARUS sensor unit near (moving) iron parts or magnets.
Variable and/or wind values are not plausible.	The installation position of the LARUS sensor unit has not been calibrated.	Perform the calibration (Calibration of the LARUS Sensor Unit).

Table 4: Troubleshooting

B Technical Specifications

Weight	80g
Housing dimensions without knob	60,5 mm x 63,4 mm x 31,2 mm
input voltage	9 - 28 V DC
current consumption	80 mA
interfaces	RS232-Rj45, CAN-Rj45, 4-Input, 2-Output-DSub9, Micro-SD, 3,5 mm Audio
NMEA interface	RS232 38400 Baud, specification
CAN interface	1 MBAud, specification
temperatures	-30°C ... 60°C
moisture	0% - 90 %
case material	Black anodised aluminium

Table 5: Technical Specifications

C Flight Menu

Flight Menu
- Water Ballast
- Bugs
- Pilot Weight
- Display
- User Profile
- Return

D Settings Menu

- Settings
  - Views
    - Circling
      - Center Content
      - Info 1 Content
      - Info 2 Content
      - Info 3 Content
      - Return
    - Straight
      - Center Content
      - Info 1 Content
      - Info 2 Content
      - Info 3 Content
      - Return
    - Units
      - Horizontal Speed
      - Vertical Speed
      - Height
      - Return
    - Energy Arrow
    - Display Rotation
    - Glider Symbol
    - Return
  - Advanced
    - User Profiles
      - Usage Mode
      - Code
      - Config Reset
      - Factory Reset
      - Return
    - Vario
      - Avg Climb Source
      - TC Climb Rate
      - Vario Upper Limit
      - Vario Lower Limit
      - Return
    - Speed to Fly
      - TC Circle Hyst
      - TC Speed to Fly
      - Vario Control
      - StF Pin Config

- StF Upper Limit
- StF Lower Limit
- Return

- Gear Alarm
  - Alarm Volume
  - Gear Alarm Config
  - Gear Pin Config
  - Airbrakes Pin Config
  - Return

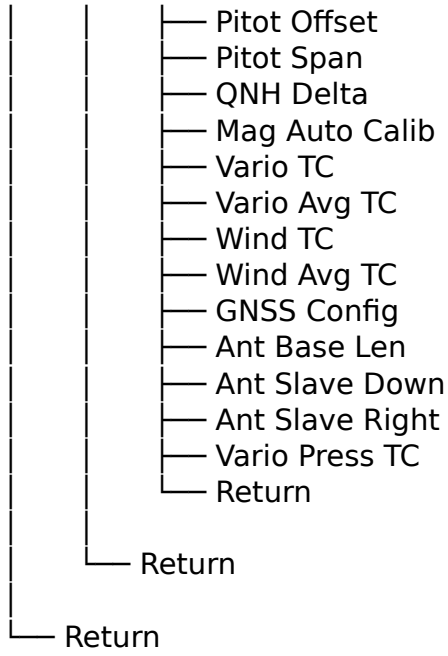
- Drain Control
  - Drain Pin Config
  - Flow
  - Return

- More Settings
  - Battery Good
  - Battery Low
  - Flash Control
  - Return

- Center Frequency
- Return

- Polar Settings
  - Glider
  - Empty Mass
  - Max Ballast
  - Reference Weight
  - Polar V 1
  - Polar V 2
  - Polar V 3
  - Polar Si 1
  - Polar Si 2
  - Polar Si 3
  - Return

- Sensor Box
  - Left Wing Down
  - Right Wing Down
  - Wings Straight
  - Calc Orientation
  - Straight Flight
  - Reset Sensorbox
  - Init Settings
    - Sensor Tilt Roll
    - Sensor Tilt Pitch
    - Sensor Tilt Yaw


Pitot Offset
Pitot Span
QNH Delta
Mag Auto Calib
Vario TC
Vario Avg TC
Wind TC
Wind Avg TC
GNSS Config
Ant Base Len
Ant Slave Down
Ant Slave Right
Vario Press TC
Return
Return
Return