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1 Preliminary Remarks

1.1 Important Notices

Before using any part of the system, please read and understand this manual. All information in this document is subject to change without notice. The latest version can be downloaded from www.stefly.aero.

CoTexx GmbH does not accept responsibility for damages which are the result of installation and operation of the device.

1.2 Limited Warranty

The LARUS Vario Display as well as its accessories are warranted to be free from defects in materials or workmanship for two years from the date of purchase. Within this period, CoTexx will, at its sole discretion, repair or replace any components that fail in normal use. Such repairs or replacement will be made at no charge to the customer for parts and labor, provided that the customer shall be responsible for any transportation cost. This warranty does not cover failures due to abuse, misuse, accident, or unauthorized alterations or repairs.

1.3 Conventions and Pictograph Definitions

The safety instructions in SteFly operating manuals are the result of risk evaluations and hazard analyses. In this document, the following hazard levels and information are considered:



Pay special attention to critical notes marked with a yellow caution symbol, because non-observance may result in damage or any other critical situation.



A red caution symbol signals that non-observance may result in injuries.



Command to perform an action or task associated with a source of danger, the disregarding of which may result in serious accidents.



A blue cloud indicates useful information or tips.

2 Safety

2.1 Safety Precautions



Duty to inform

Each person involved in the installation or operation of LARUS must read and observe the safety-related parts of these operating instructions.

2.2 Proper Use

LARUS Vario Display visualises data which are measured and calculated by the LARUS sensor box. LARUS was designed to calculate direction and strength of thermals and wind quickly and reliably. Therefore, the sensor unit combines data from high-precision sensors and GNSS receivers in sophisticated algorithms.

LARUS Vario Display shall be installed in the instrument panel.

LARUS Gliding Sensor Unit is an additional feature to supply glider pilots with accurate information about wind, vertical air movement as well as additional attitude of the aircraft. Its use is limited to day VFR conditions. Security decisions must be made regardless of having installed LARUS.

2.3 Improper Use

Improper use will cause all claims for liability and guarantees to be forfeited. Improper use is deemed to be all use for purposes deviating from those mentioned above, especially:

- Using LARUS data in non-VFR conditions or during night is forbidden. LARUS is not certified. Although LARUS provides AHRS data to XCSOAR you must not rely on the artificial horizon display.
- Using LARUS data during aerobatics or during flight conditions with high angle of attack (stall) or high g-forces. The algorithm was optimized for normal flight conditions.
- Operating LARUS Vario Display outside the operation conditions defined in technical data section, e.g. input voltage, temperature and humidity.

3 LARUS Vario Display Quick Start Manual

LARUS Vario Display may be operated out of the box. Simply perform the following actions:

1. Disassemble both rotary knobs with a 1,5 mm HEX key (scope of delivery)
2. Mount LARUS Vario Display in a 57 mm cutout of the instrument panel with 3 screws. It may be mounted in all four directions.
3. Assemble both rotary knobs
4. Connect the CAN port of LARUS Vario Display and LARUS Sensor Box with a 1:1 patch cable included in scope of delivery.
5. Power on LARUS
6. Check that the satellite symbol on the screen is yellow or green and the current heading is shown.
7. Choose or create a proper polar for your glider.
8. Your LARUS Vario Display is ready to fly!

4 Product Description

4.1 Scope of Delivery

The scope of delivery contains the following:

- LARUS Vario Display
- Mounting screws
- 1:1 standard RJ45 cable
- Micro SD card with adapter
- D-Sub-9 solder connector and housing
- 1,5 mm HEX key for mounting the rotary knobs

4.2 Design and Function

LARUS Vario Display shows the data measured and calculated by LARUS. LARUS is an advanced variometer with real time wind measurement capabilities. It incorporates state of the art pressure sensors, an advanced IMU and GNSS receivers to gather precise flight information data.

Key features of the display are:

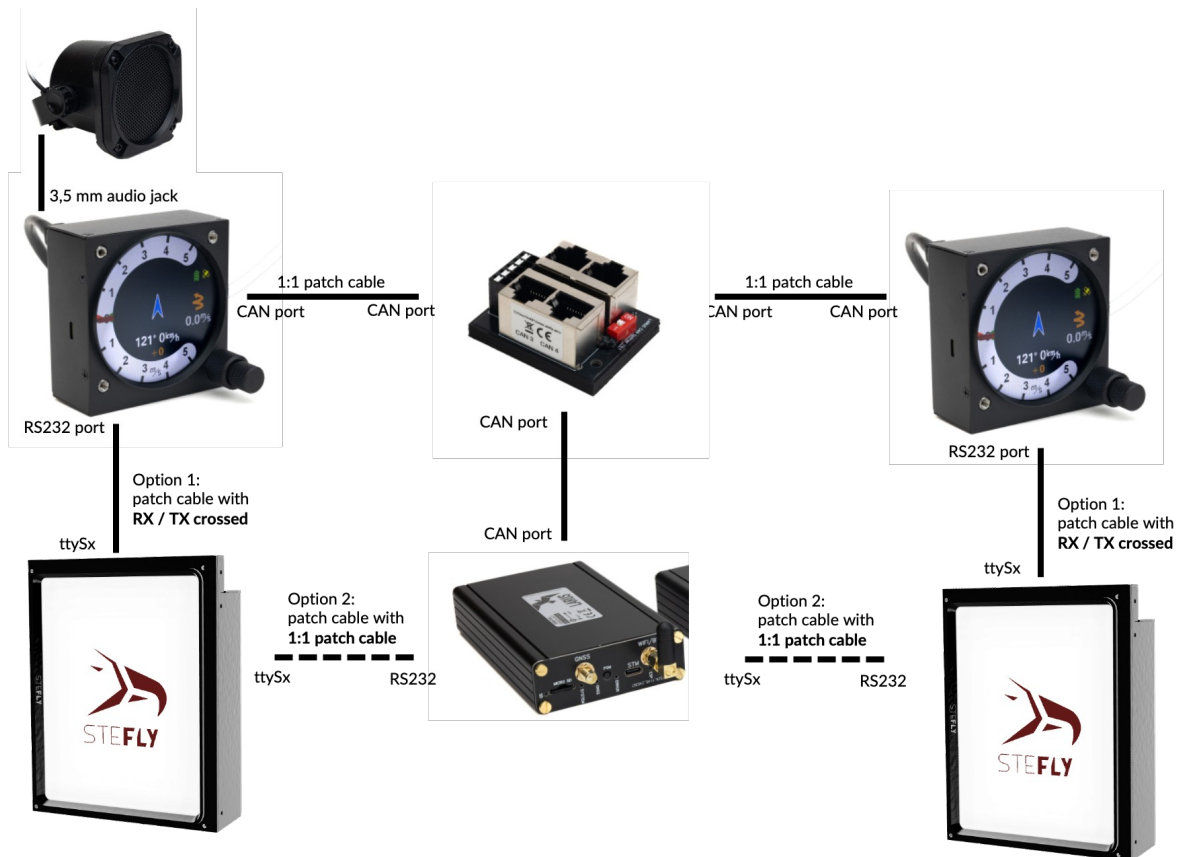
- Round display for 57 mm standard instrument panel cutouts
- Bright and colorful screen
- Lightweight, compact design with black anodized aluminum housing
- Two rotary knobs with pushbutton function to change settings and enter the menus

LARUS Vario Display is designed and continuously improved by Prof. Dr. Klaus Schäfer, Maximilian Betz, Winfried Simon, Peter Simon and the SteFly team.

The system architecture of LARUS in **Single Seater Configuration**:



The system architecture of LARUS in Double Seater Configuration:



4.3 Connectors

4.3.1 Overview of the Connectors



4.3.2 CAN and RS232 Ports



Pin	CAN	RS232
1	GND (internally connected)	GND (internally connected)
2		
3	NC	RS232_1_RX
4	CAN Low	RS232_1_TX
5	CAN High	NC
6	NC	NC
7	VCC [9-28V DC] (internally connected)	VCC [9-28V DC] (internally connected)
8		

If a serial connection (RS232) is established between SteFly NAV and LARUS Vario Display, the MC value settings, for example, can be synchronized / transferred between the devices. In addition, the LARUS Vario Display processes inputs from a Speed to Fly / Vario switch that is connected directly to the SteFly Remote Control Stick PCB (for necessary settings see chapter 5).

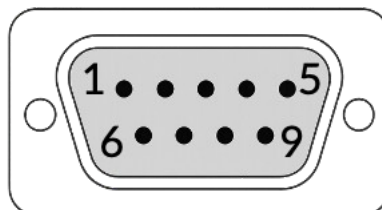
The following steps are required:

- Connect devices with cable:
 - Option 1: between Vario Display RS232 port and SteFly NAV ttySx port with **patch cable RX/TX crossed**
 - Option 2: between Vario Display RS232 port und LARUS Sensor Box with **1:1 patch cable**
- Adjust settings in XCSOar (Version 7.44 or higher) / OpenSoar (7.43 or higher):
 - If the Vario Display is connected directly to the SteFly NAV, select the corresponding ttyS port: Config -> Devices -> select a free line and enter the port, Baud rate 38400, Driver Larus, Sync. to device on

4.3.3 GPIO / D-SUB 9

Several other switches, sensors and devices can be connected via the d-sub connector. Please note that not all functions have been implemented at date of release of this manual.

The following sketch shows the view into the male connector of the LARUS Vario Display.



Pin number	Pin name	I/O
1	GND	(Ground)
2	DI3 - Gear	Input

3	DI1 – Water Ballast	Input
4	DO2	Output
5	GND	(Ground)
6	DI4 – Speed Brakes	Input
7	DI2 – Speed to Fly	Input
8	GND	(Ground)
9	DO1 – SteFly Canopy Flasher	Output

For easier pin identification these numbers are also molded into the female connector (scope of delivery).

After wiring, settings must be made in the LARUS Vario Display, see chapter 5.

4.3.4 Audio

An audio socket is available for connecting a loudspeaker with a 3.5 mm jack plug. The internal resistance of the speaker must be between 4-8 Ω (max. output of 3 W @ 8 Ω).



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

4.3.5 SD-Card

The device has an SD card slot for firmware updates.



As SD card extensions can damage the LARUS Vario Display, we do not accept any liability for damage resulting from their use.

4.4 CAN Termination

LARUS Vario Display and LARUS Sensor Box are connected via CAN. CAN bus networks require termination resistors at each end of the network. Therefore, all units have integrated a switch to activate the resistor:



CAN termination switch
LARUS Vario Display



CAN termination switch
LARUS Sensor Box



CAN termination switch
CAN Splitter

The following table gives examples of how to set the CAN termination switches:

Description	Display front	LARUS box	CAN Splitter	Display rear
Single seater	on	on	-	-
Double seater, LARUS box in front panel	off	on	off	on
Double seater, LARUS box in rear panel	on	on	off	off

Please note: All LARUS Sensor Boxes delivered before March 2025 have no CAN termination switch. CAN termination is always on from default.

4.4.1 Installation



Usually, LARUS Vario Display is powered by LARUS via patch cable between the CAN ports. LARUS needs to be protected by an external fuse (500 mA to max. 3A) like it is common practice for all electric devices in aviation. If LARUS gets its energy from another main instrument (e.g. SteFly NAV via D-Sub connector) please make sure that the main instrument is protected by an external fuse.

4.5 Installation Location

The following picture shows a typical installation situation of LARUS Vario Display in the instrument panel of a glider.



The display fits in a standard 57 mm cutout and is fastened by 3 M3 screws.

For installation it is required to remove the two rotary knobs with a HEX 1,5mm key.



4.6 Installation Orientation



If you intend to replace an existing instrument with the Larus Vario Display, check the desired installation position before drilling the 7.3 mm hole for the rotary encoder due to the asymmetrical housing to the display

The display can be mounted in the orientations 0° / 90° / 180° / 270°.

After mounting the display, its orientation needs to be configured in the menu Display Rotation.

4.7 Initial Operation and Function Test

For initial operation please follow these steps:

1. Check that the LARUS Vario Display is connected to LARUS Sensor Box or CAN Splitter according to the drawings in chapter 4.2
2. Power on LARUS
3. Check that LARUS Vario Displays boots and a yellow or green satellite pictogram appears. The vario pointers should perform slight movements around zero position.

4.8 Firmware Updates

The LARUS team is continuously improving the software and releasing updates e.g. on LARUS Vario Display web page.

To update the firmware, put the new .bin-file on the SD card included in scope of delivery and insert it into the SD-card slot of LARUS Vario Display. The device will only install compatible firmware releases greater than the release installed. After powering on, the device is booting within less than a second. If a compatible firmware is detected on the SD Card, the display keeps black for about 3-5 seconds before displaying the a Firmware Upgrade is in process. Afterwards the name of the new firmware version will appear.

If the update is not initialized after powering on the device with an inserted SD card containing a new firmware release, please use a different SD card.

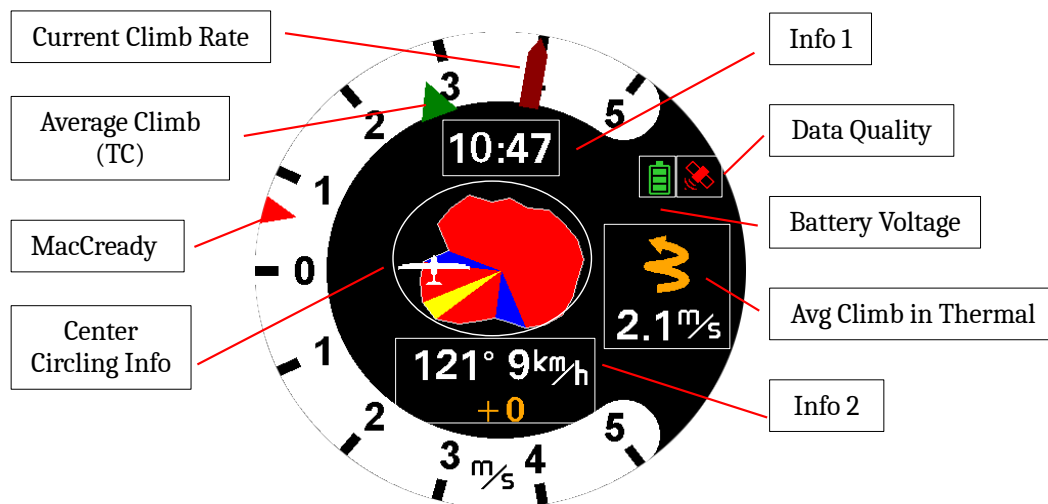
Requirements for the SD card: min. 4 GB SDHC, FAT32 format (not GPT)

5 Operation

5.1 Display

The information displayed differs depending on the flight phase:

5.1.1 Thermal Circling (Climb)



Info 1: The parameter shown is defined in [Info 1 Content](#).

Data Quality: the color of the symbol indicates:

- Red: no connection to LARUS Sensor Unit
- Yellow: connection to LARUS Sensor Unit established, Unit has no GPS-Fix
- Green: connection to LARUS Sensor Unit established. Unit has GPS-Fix

Battery symbol: the color of the symbol indicates:

- Green: Voltage of the battery is above [Battery Good](#)
- Yellow: Voltage of the battery is below [Battery Good](#)
- Red: Voltage of the battery is below [Battery Low](#)

Average Climb in Thermal: The average climb rate since starting circling

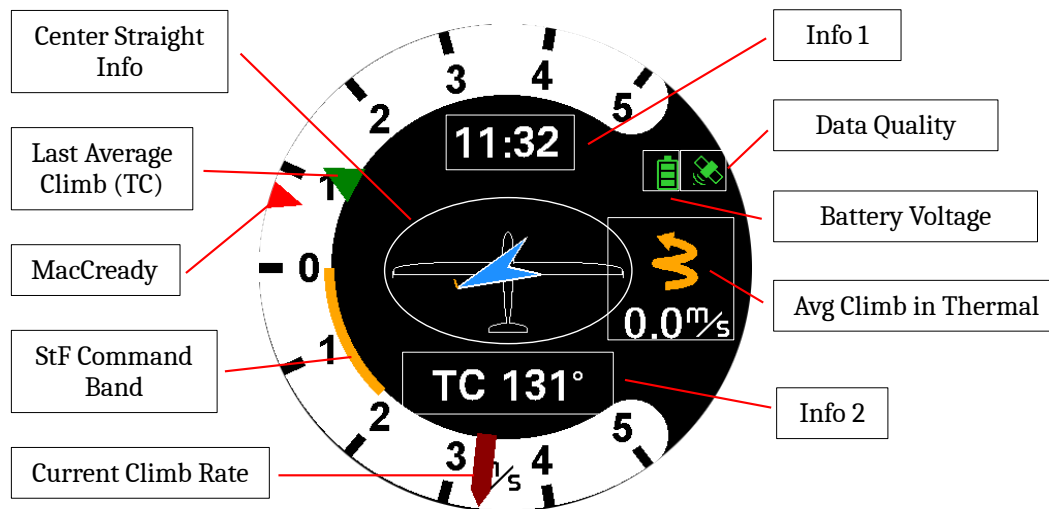
Info 2: The parameter shown is defined in [Info 2 Content](#).

Current Climb Rate: Time Constant can be changed in Sensor Unit settings [Vario TC](#)

Average Climb (TC): The average climb rate in the timespan defined in the [TC Climb Rate](#)

Center Circling Info: Select one of four available [graphical representations](#)

5.1.2 Straight Flight (Cross-Country Flight)



Displays that differ from Thermal Circling Mode:

Center Straight Info:

StF Command Band:

Last Average Climb (TC):

5.2 Control Elements

The device has 2 rotary knobs and a push button that can be used to make various settings.

The following functions are assigned to the button and the two rotary knobs:

- **Turn the small/upper rotary knob:** Volume control
- **Turn the large/lower rotary knob:** Set the MacCready value
- **Short press on the upper rotary knob:** Menu for common settings
- **Long press on the upper rotary knob:** Menu for configuration settings of the LARUS Vario Display, configuration and calibration of LARUS Sensor Unit.

The following two chapters show the menu structure of the LARUS-Vario. Details on the submenu items are documented in the subsequent chapters..

5.2.1 Short Press Menu Structure

- **Water Ballast**
Set the current value for the amount of water ballast. The entered value is propagated to XCSoar/OpenSoar.
- **Bugs**
Set the fly correction factor in percent to adjust the polar values to the contamination situation of the wing.
- **Pilot Weight**
Enter the pilots weight in kg for the area load calculation.
- **Display**
Use this option to change between Vario and AHRS display.



The purpose of the LARUS Varios AHRS display is providing information for validating the Larus Sensor Data (magnetic heading course and spatial position of the sensor/airplane). The AHRS display must not be used as an flight instrument.

5.2.2 Long Press Menu Structure

- Views
 - Info 1 Content
 - None
 - Avg Climb Rate
 - Drift Angle
 - Flight Level
 - Speed To Fly
 - True Course
 - UTC Time
 - Info 2 Content
 - Has the same options as *Info 1 Content*
 - Center Circling
 - Single Arrow
 - Spider Assistant
 - Dotted Assistant
 - Spider Assistant
 - Center Straight
 - Single Arrow
 - Double Arrow
 - Display Rotation
 - Rotate 0/90/180/270
 - Glider Symbol
 - On / Off
- Advanced
 - User Profile
 - User Profile 1
 - User Profile 2
 - User Profile 3
 - User Profile 4
 - Do not change
 - Center Frequency
 - Select the Frequency for 0 m/s (500-1000 Hz)
 - Battery Good
 - Set the voltage value below which the battery symbol is shown in yellow
 - Battery Low
 - Set the voltage value below which the battery symbol is shown in red
 - Flash Control
 - Not connected
 - Active: open
 - Active: close
 - Config Reset
 - Default Configuration
 - Factory Reset
 - Do not change
 - Average Climb Rate

- Average Climb Source
 - Frontend
 - Sensorbox
- TC Climb Rate
- Speed to Fly
 - TC Speed To Fly
 - Vario Control
 - STF Pin Config
- Gear Alarm
 - Alarm Volume
 - Gear Alarm Config
 - On Pin Mode
 - Two Pin Mode
 - Gear Pin Config
 - When opened
 - When closed
 - Not connected
 - Air Brakes Pin Config
 - When opened
 - When closed
 - Not connected
- Drain Control
 - Drain Pin Config
 - When opened
 - When closed
 - Not connected
 - Lowest Flow
 - value in Liters/sec
 - Flow Slope
 - time based correction value
- Return
- Polar Settings
 - Glider
 - Empty Mass
 - Max Ballast
 - Reference Weight
 - Polar V1
 - Polar V2
 - Polar V3
 - Polar Si1
 - Polar Si2
 - Polar Si3
 - Return
- Sensorbox
 - Left Wing Down
 - Right Wing Down
 - Wings Straight
 - Calc Orientation
 - Straight Flight
 - Reset Sensorbox
 - Ini 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 Len
- Ant Slave Right
- Return
- Return
- Return

6 Maintenance

The whole system has no serviceable parts.

To obtain warranty service, please SteFly directly.



Opening the housing of LARUS Vario Display will void the warranty!

7 Troubleshooting

Problem	Possible Causes	Solution
LARUS Vario Display boots, but satellite pictogram is red and vario pointers are fixed	Connection to LARUS CAN port with Rx / Tx crossed patch cable instead of standard 1:1 patch cable	Change the patch cable and use the one supplied in scope of delivery
	Connection to LARUS via RS232 port	Connect the CAN ports instead

8 Technical Data

Size	Unit	Value
mass	g	80
Housing dimensions (without knob)	mm (length x width x height)	60,5 mm x 63,4 mm x 31,2 mm
input voltage	V DC	via patch cable with RJ45 connector from LARUS Sensor Box or CAN Splitter, 9 – 28 V DC
amperage	mA (@ 13,0 V DC)	80
interfaces		RS232 (x1) - RJ45 CAN (x1) - RJ45 microSD 3,5 mm audio jack
operating temperature	°C	-30 to +60
operating rel. humidity	%	0 - 95
material housing		black anodized aluminium