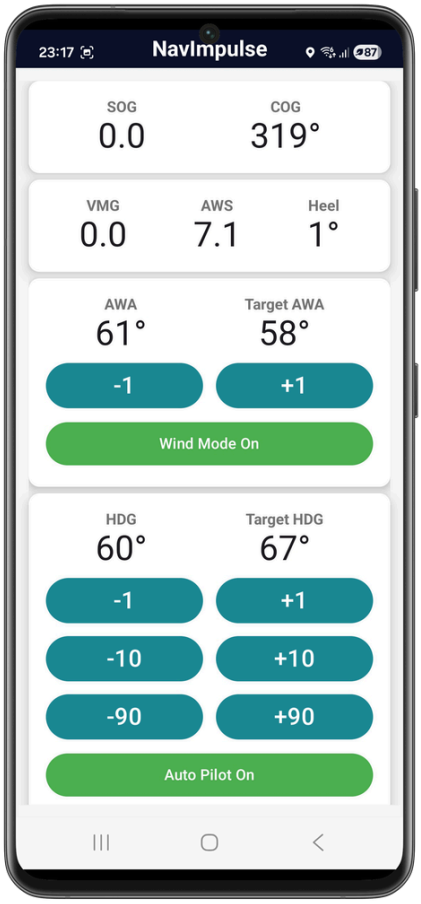
NavImpulse

Marine Electronics

NAVIMPULSE AUTOPILOT
TECHNICAL SPECIFICATIONS

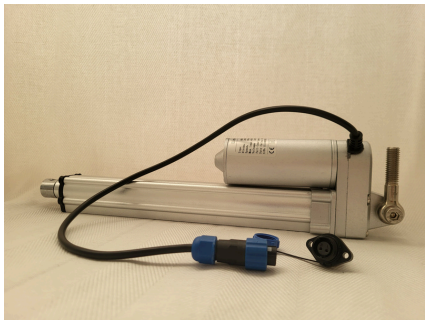


The Smart Autopilot for the Modern Sailor

Autopilot Brain Specifications

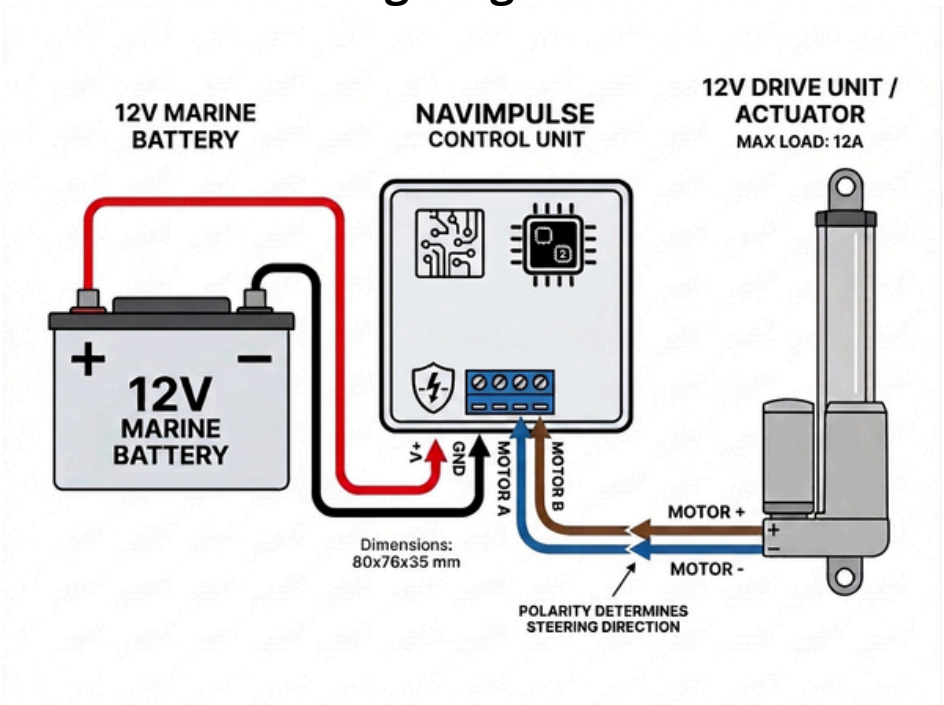
- **Processor:** Dual-Core Architecture (Dedicated PID real-time processing)
- **Sensor Fusion:** Integrated 9-Axis Gyro-stabilized System
- **Power Input:** 12V DC
- **Drive Output:** High-current PWM control. Max Load: 12A continuous
- **Connectivity:** Encrypted Bluetooth Low Energy (BLE)
- **Environment:** Interior / Dry area installation only (Not waterproof)
- **Dimensions:** 80 x 76 x 35 mm
- **Weight**: Lightweight design, approx. 85g
- **Mounting**: 4x M4 screw holes for secure mounting

Tiller Drive Specifications



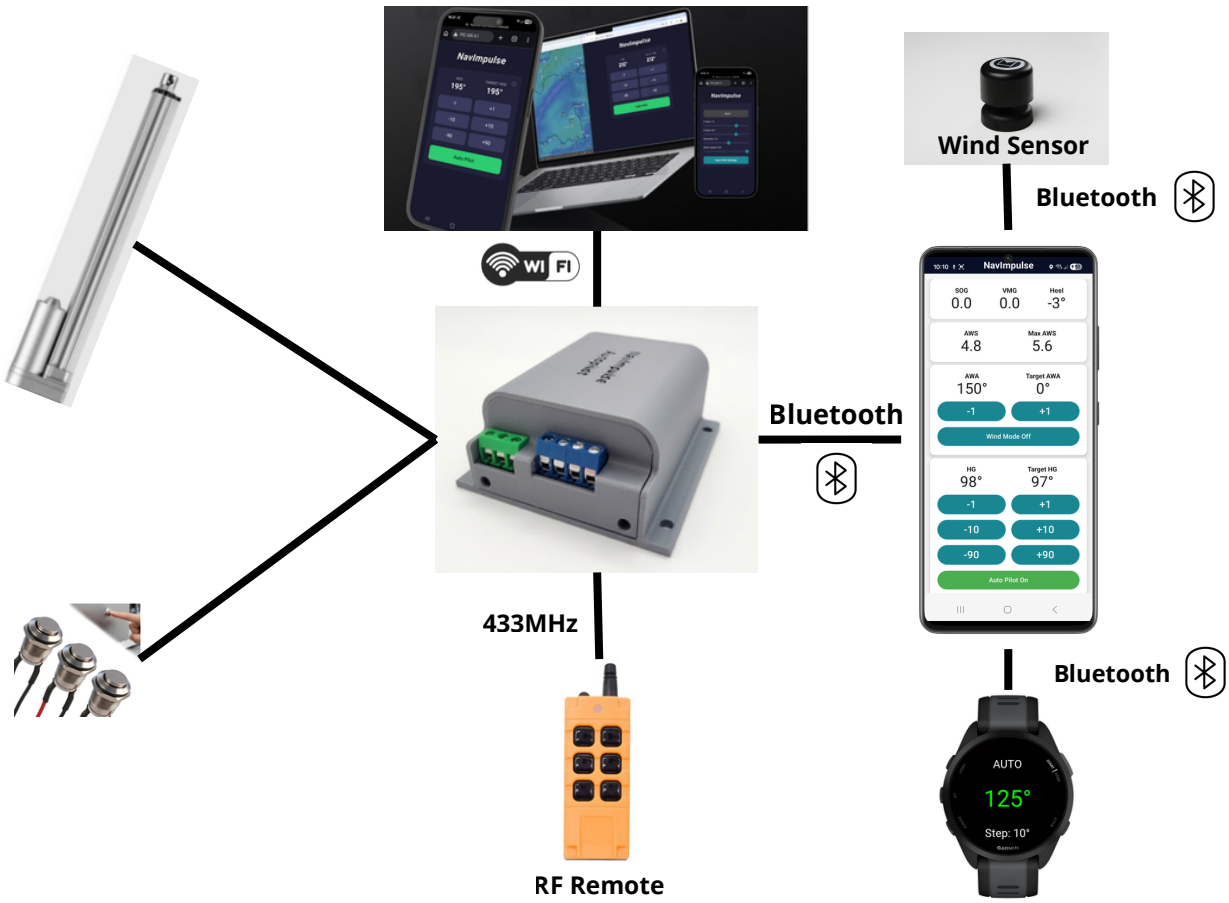
- **Stroke:** 200mm or 250mm
- **Speed** : 55 mm/s
- **Max boat weight** : 6000 kg
- **Max boat length** : 11M
- **Max power:** 85W / 400N
- **Voltage:** 12V
- **Water protection :** IP65
- **Material:** aluminum
- **Cable length:** 1M

Wiring Diagram

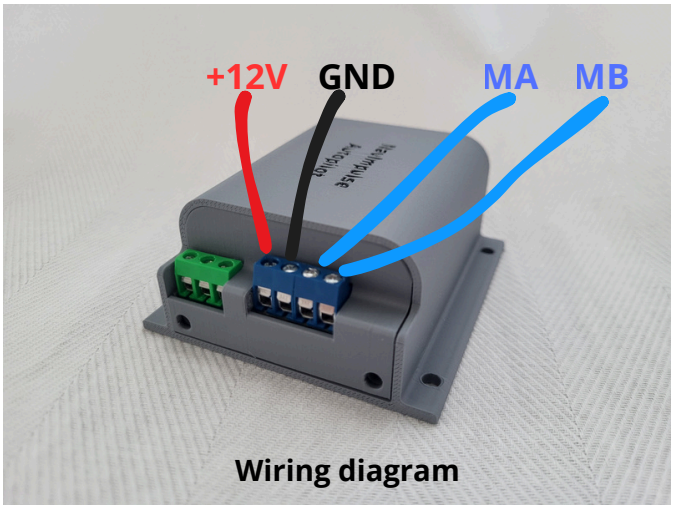


IMPORTANT : During initial setup, manually test the steering direction with the app. If the drive unit moves the rudder in the opposite direction (e.g., moves 'Port' when app commands 'Starboard'), immediately stop and swap the connections on the 'Motor A' and 'Motor B' terminals to correct polarity.

System Connectivity Architecture



NavImpulse Autopilot – Installation Manual



1. Safety & General Guidelines
Disconnect Power: Always disconnect the main 12V battery supply before starting the installation to prevent short circuits.
Environment: Mount the unit in a dry location protected from direct water splash, excessive moisture, and extreme heat.
Wire Gauge: Use appropriate marine-grade wire gauges suitable for your motor's current consumption to avoid voltage drops.

2. Mounting the Unit
The housing features built-in mounting flanges on the sides.
Place the unit on a flat, rigid surface.
Secure it using appropriate screws through the pre-drilled mounting holes.
Ensure there is enough clearance in front of the terminal blocks for easy wire routing and maintenance.

3. Wiring and Connections
The device features two main color-coded screw terminal blocks at the front. Strip about 5–6 mm of insulation from your wires, insert them fully into the terminals, and tighten the screws securely.
Green Terminal Block: Push-Button Controls
This block is dedicated to your physical external control buttons. Connect momentary push-buttons according to the following layout :

Terminal Pin (Left to Right) Function Description

- Pin 1 (Left) | Short press: -1° | Course correction 1 degree to port
- Pin 1 (Left) | Long press (>1.5s): -90° | Tack to port — immediate 90° course change
- Pin 2 (Middle) | Short press: ON / OFF | Standby / Engagement toggle
- Pin 3 (Right) | Short press: +1° | Course correction 1 degree to starboard
- Pin 3 (Right) | Long press (>1.5s): +90° | Tack to starboard — immediate 90° course change

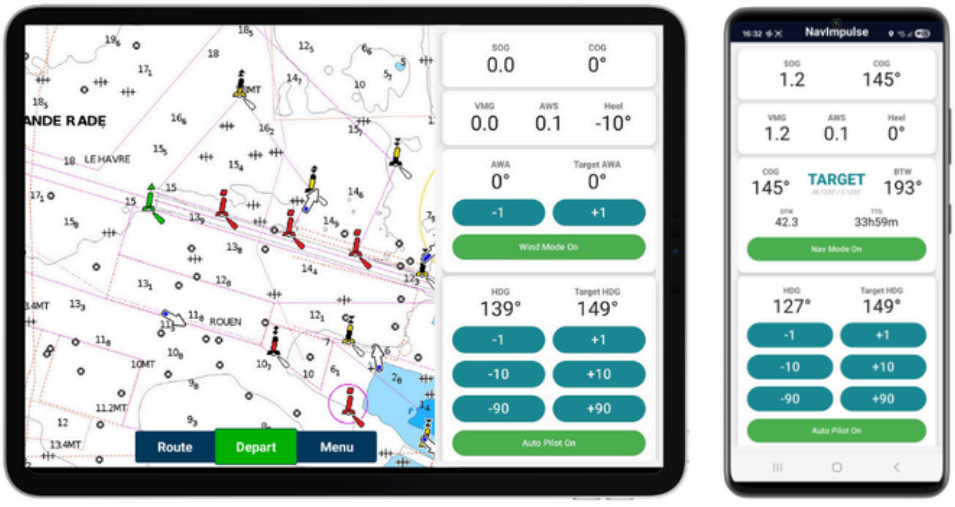
Blue Terminal Block: Power & Actuator (Drive)
This block handles the main 12V power input and the high-current output to your steering actuator.Terminal Pin (Left to Right)FunctionConnection Details

- Pin 1 (Far Left)+12V PowerConnect to the positive terminal of your 12V DC battery
- Pin 2-12V (GND)Connect to the negative terminal of your 12V DC battery
- Pin 3 Motor Output (+)Connects to the linear drive / actuator motor
- Pin 4 (Far Right)Motor Output (-)Connects to the linear drive / actuator motor

⚠️ Note on Motor Direction: If the autopilot steers in the opposite direction during your first sea trial (e.g., correcting to port when it should go to starboard), simply swap the two motor wires (Pin 3 and Pin 4) on the blue terminal block.

Android App

Requirements: Android 9.0 or higher



NavImpulse Android App Features

1. Multi-Mode Navigation Control
The system offers three distinct piloting modes :

- **Compass Mode (Auto Pilot)**: Maintains a fixed magnetic heading (Target HDG). Users can adjust course with precision increments of 1°, 10° or 90°.
- **Wind Mode:** Connects via BLE to Calypso portable wind sensor or via Wi-Fi to NMEA data to maintain a precise Target Apparent Wind Angle (AWA).
- **Navigation Mode (Waypoint):** Precision guidance to your selected waypoint. The system dynamically updates distance and remaining travel time based on your current Speed Over Ground.

2. Real-Time Telemetry & Monitoring
The dashboard acts as a central hub for critical vessel data:
Vessel Dynamics: Real-time display of Heading (HDG), Speed Over Ground (SOG), Course Over Ground (COG), and Heel angle.

Performance Metrics: Automatic calculation of VMG (Velocity Made Good) to optimize speed toward the wind or destination.
Advanced Sensor Fusion and automated Sensor Calibration: No manual calibration needed.

3. Safety & Emergency Features

- **Heading Alert System**: Allows users to set "Port" and "Starboard" safety limits. An OUT OF RANGE visual and audible alert triggers if the vessel deviates beyond these boundaries.
- **Emergency MOB (Man Over Board)**: A specialized function that instantly captures and displays the precise GPS coordinates of the incident.

4. Advanced Connectivity & Integration
The app serves as a sophisticated data gateway:
BLE (Bluetooth Low Energy): Seamlessly connects the NavImpulse Control Unit, Wind Sensors, and Garmin Smartwatches for remote wrist-based control.
WiFi NMEA Gateway: Ability to bridge and use wind data from onboard NMEA network.
Foreground Service Execution: Ensures the autopilot remains fully operational and connected even when the app is in the background or the screen is locked.

5. Professional Tuning (Pilot Settings)

- Dynamic Response: Access deep calibration settings to adjust the autopilot's reactivity, P and D gains, tailoring the system to your vessel's displacement and hull shape.
- Smart Autotune: Includes an intelligent Autotune function that automatically calculates and adjusts the P-gain in real-time to optimize steering stability without manual trial and error.

6. Voice Control
Take command of your vessel without lifting a finger.

- Hands-Free Navigation: Use simple voice commands to adjust your heading or engage the autopilot.
- Full Focus: Keep your eyes on the horizon and your hands on the lines during critical maneuvers.
- Offline Privacy: Voice processing is done 100% locally on your phone—no internet required.

7. Smartwatch Remote
Control your boat from anywhere on deck right from your wrist.

- Garmin Integration: Use your Garmin watch as a wireless remote to tweak your course or monitor status.
- Total Freedom: Whether you are at the bow or in the cabin, you stay in control via a secure Bluetooth link.

8. Smart MOB detection

- Connection-Loss Protocol: The app constantly monitors the smartwatch link; if the connection is lost (crew overboard), an emergency alert is triggered.
- Auto Head-to-Wind: If enabled and the autopilot is active, the system automatically turns the boat into the wind to stall it.
- Instant GPS Save: Immediately marks the exact MOB coordinates and sounds a loud alarm for the remaining crew.
- Note: Requires Wind Mode to be available.

NavImpulse Android App User Manual

First Launch
When you open the app for the first time, you'll see a permissions and safety agreement screen. Read it carefully, then tap "I understand and agree to the terms" to proceed. The app will then request access to:

Location & Bluetooth — to connect to your autopilot and provide navigation data
Microphone — for voice commands
Background access — so the app keeps running when your screen is off
These permissions are required for the app to function safely at sea.

Connection
Go to General Settings to find the connection card at the top.
Tap Connect to scan for and connect to your NavImpulse Brain
Tap Disconnect to close the connection cleanly
The card shows connection status, authentication status, wind sensor status, and Garmin watch status
The app connects automatically on subsequent launches if the device is already paired.

Main Screen
The main screen is your dashboard. It displays all key sailing data and autopilot controls in a scrollable view.
Speed & Course Card.
Shows SOG (Speed Over Ground) and COG (Course Over Ground) from your GPS.
Wind & Heel Card.
Shows VMG (Velocity Made Good), AWS (Apparent Wind Speed), and Heel angle.

Wind / Waypoint Card (swipeable)
Swipe left or right between two cards:

Wind Card — shows AWA (Apparent Wind Angle), target AWA, and Wind Mode toggle
Waypoint Card — shows your active destination with BTW, DTW, TTG, and Nav Mode toggle. Long-press to open the Waypoint Manager.

Pilot Control Card
The core of the app. Shows current HDG (Heading) and Target HDG. Use the buttons to adjust your target heading:
±1° — fine correction
±10° — standard correction
±90° — tack / gybe (works on long press only for safety)
Tap Auto Pilot On/Off to engage or disengage the autopilot. Long-press the card to open Pilot Settings.

Heading Alert Card
Set a Port Limit and Starboard Limit (0–359°). Enable the alert to be notified if your heading drifts outside that range.

Head to Wind Button
Immediately points the bow into the wind. Only available when conditions allow (autopilot connected and engaged).

Autopilot Modes :

- **Heading Mode**

The autopilot holds a fixed compass heading. Adjust with the ±1 / ±10 / ±90 buttons.

- **Wind Mode**

The autopilot holds a fixed apparent wind angle instead of a compass heading — ideal for sailing upwind or downwind in variable conditions. Activate from the Wind Card. Adjust target AWA with the -1 / +1 buttons.

- **Nav Mode**

The autopilot steers toward a saved waypoint using GPS bearing. Activate from the Waypoint Card after selecting an active waypoint. The app will notify you when you arrive within 30 meters of the destination.

Waypoints

Long-press the Waypoint Card on the main screen, or navigate via the Waypoint Manager.
To add a waypoint:

1. Enter a name
2. Enter latitude (−90 to 90)
3. Enter longitude (−180 to 180)
4. Tap Add to Library
5. To activate a waypoint: check the checkbox next to it. It will then appear on the main Waypoint Card.
6. To delete a waypoint: tap the trash icon.
7. Only one waypoint can be active at a time.

MOB / Watch Alert

If a Man Overboard event is triggered (via Garmin watch or the app), the screen displays a red alert with the GPS coordinates of the incident. Tap DISMISS & STOP ALARM to silence the alert and cancel the emergency.

General Settings

Access via the GENERAL SETTINGS button on the main screen.
Setting Description:

- Voice Control Enable hands-free heading commands via microphone
- Calypso Wind Data Connect to a Calypso Bluetooth wind sensor
- NMEA Wind Data Receive wind data over Wi-Fi from a NMEA source
- Use Smartphone IMU Use the phone's compass instead of the autopilot's built-in IMU (for tests only)
- Watch Disconnect Alert Get an alert if your Garmin watch disconnects
- MOB: Head to Wind Automatically head to wind if the watch triggers a MOB alarm
- NMEA Wi-Fi Port Set the UDP port for NMEA data output (default: 2000)
- Magnetic Offset Correct compass deviation (−180 to +180°)
- Set Heel Reference Calibrate the heel angle to zero in your current position
- Login / Reset Password Authenticate with your 6-digit PIN to access protected settings

Pilot Settings

Long-press the Pilot Control Card on the main screen to access pilot tuning.
Parameter Description:

- P Gain Proportional response — higher = more aggressive corrections
- D Gain Damping — higher = smoother, less oscillation
- Reactivity of motor response (0.1 = slow, 1.0 = instant)
- Motor Speed Maximum motor power (0–255)
- Autotune Let the system self-tune the P gain automatically

→ Tap “Save Pilot Settings” to save the values to the autopilot.

NavImpulse Garmin Smartwath Remote Control

NavImpulse transforms your Garmin smartwatch into a powerful remote for your NavImpulse Autopilot system.

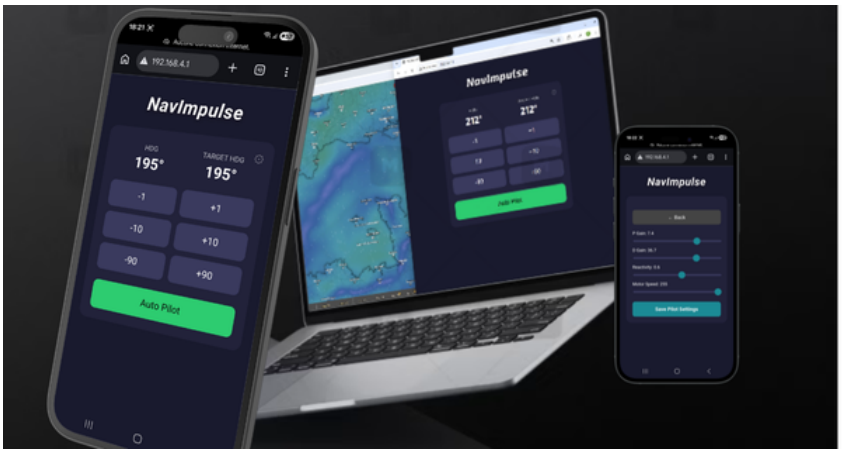
Key Features:

- Precision Steering: Instantly adjust your course by 1°, 10°, or 90° increments with simple physical Up and Down button presses. Perfect for wet or gloved hands.
- Hybrid Interface: Use a double-tap gesture to toggle between step increments (or long-press the up button for non-touchscreen watches).
- Haptic Feedback: Feel every command with custom vibration profiles, ensuring your input is registered even in heavy seas and wind.
- High-Contrast Display: Optimized for maximum readability under direct sunlight.

I**nstallation & Requirements:**
This watch app requires the NavImpulse Android App : https://play.google.com/store/apps/details?id=com.navimpulse to be running on your connected smartphone or tablet to bridge with your NavImpulse Autopilot system.

Setup Requirements
1- Install the NavImpulse Android App on your smartphone: https://play.google.com/store/apps/details?id=com.navimpulse&pcampaignid=web_share
2- Connect your phone to your NavImpulse Autopilot hardware.
3- Launch this Garmin app to take command from your wrist.

NavImpulse Web Interface



The NavImpulse autopilot includes a built-in web interface accessible from any smartphone, tablet, or laptop with a browser. It gives you full control over the autopilot without needing the Android app — useful as a backup, or for quick access from a guest device on board.

Connecting to the Interface

1. On your device, open the Wi-Fi settings and connect to the network named `navimpulse
   - Password: navimpulse
2. Open any browser (Chrome, Safari, Firefox ...)
3. Navigate to http://192.168.4.1
4. The NavImpulse control panel will appear

No internet connection is required. The autopilot creates its own local Wi-Fi network.

Main Screen

Once connected, the main screen displays two key values at the top:

- HDG : the current heading of your boat, updated every second
- Target HDG : the heading the autopilot is steering toward

Heading Adjustment Buttons

Six buttons allow you to adjust the target heading:

+1 / -1	Adjust target heading by 1°
+10 / -10	Adjust target heading by 10°
+90 / -90	Adjust target heading by 90° (a confirmation dialog appears before executing)

These buttons work whether the autopilot is on or off. When the autopilot is off, the ±1° and ±10° buttons also briefly move the tiller to give you a feel for the direction.

Settings Screen

Tap the ⚙️ icon (top left) to open the settings screen.
Here you can fine-tune how the autopilot responds.

Tip:Start with the default values and make small adjustments. Change one parameter at a time and observe the boat's behaviour before adjusting further.

RF Remote Screen
Tap the 📱 icon (top right) to open the RF remote configuration screen.
This screen is used to assign the buttons of your 433 MHz wireless remote to autopilot commands.
How to assign a button
1. Press the button on your remote — its code appears at the top of the screen under **Received code**
2. Find the command you want to assign it to (e.g. `plus1`, `pilotOn`)
3. Tap **Assign** next to that command — the received code is copied into the field
4. Repeat for all buttons you want to configure
5. Tap **Save** to store all assignments permanently

Available commands :
pilotOn	Enable autopilot
pilotOff	Disable autopilot
plus1 / minus1	Adjust heading by ±1°
plus10 / minus10	Adjust heading by ±10°
plus90 / minus90	Adjust heading by ±90°

Synchronization with the Android App
The web interface and the NavImpulse Android app stay in sync automatically. Any action taken from the web interface — turning the pilot on, changing the target heading, adjusting a setting — is immediately reflected in the app, and vice versa.

Disabling Wi-Fi to Save Power
If you do not need the web interface during a long passage, you can turn off Wi-Fi from the Android app to reduce power consumption. Wi-Fi can be re-enabled any time via restart.

Troubleshooting
The page does not load ?
Make sure your device is connected to the `navimpulse` Wi-Fi network and not your home or marina Wi-Fi. Some devices may try to switch back to a known network automatically.
The heading is not updating ?
Refresh the page.
Settings were not saved after restarting
Make sure you tapped Save Pilot Settings after adjusting the sliders. Changes are applied immediately but only stored permanently when you explicitly save them.

IMPORTANT: Legal Disclaimer & Safety Warning

FOR NAVIGATION AID ONLY
NavImpulse is designed and provided as a navigation aid only. It is not a replacement for active seamanship or constant manual watchkeeping.

LIMITATION OF LIABILITY
By using this system, the user acknowledges and agrees to the following:

- **Skipper's Responsibility**: The skipper remains solely responsible for the safety of the vessel, crew, and third parties at all times. You must be ready to take manual control of the helm instantly.
- **Operational Constraints**: Do not use NavImpulse in congested waters, near shore, or in any conditions requiring continuous human vigilance.
- **Environmental Factors**: System performance relies on external signals and can be degraded by electromagnetic interference, GPS signal loss, or extreme weather conditions.

WARRANTY & RISK

- Legal Warranty: This product is covered by the standard EU legal warranty of conformity, covering manufacturing defects and hardware failures under normal use.
- Fitness for Purpose: Beyond legal mandates, the system is provided without guarantee of suitability for a specific vessel. The user is responsible for ensuring NavImpulse is compatible with their specific boat displacement and actuator power requirements.
- Smart MOB & Head-to-Wind: The emergency "Head-to-Wind" function is a secondary safety layer. It relies on an active Bluetooth connection, a specific configuration (Enabled/Auto-mode), and available Wind Mode data. It is not a guaranteed life-saving device.
- Assumption of Risk: The developers shall not be liable for any direct or consequential damages, including collisions, groundings, injuries, or loss of life resulting from the use, misuse, or technical malfunction of this software or hardware.