Manual

argoTrackPilot

Automatic track-keeping system for inland vessels

Version 2.7

25.05.2022

Version	Datum	Änderung	Bearbeiter
1.0	05.12.2017	English version	Lachmeyer
1.1	21.05.2019	Update to newest software	Eichler
2.0	08.01.2021	Update to software version 2.0	Eichler
2.1	06.04.2021	Update to software version 2.1	Eichler
2.2	04.11.2021	Update to software version 2.2, added chapter 7.5, 7.6	Eichler
2.3	04.03.2022	Updated to software version 2.3, added chapter 7.7	Eichler
2.6	30.11.2022	Updated to software version 2.6	Eichler
2.7	25.05.2023	Updated to software version 2.7	Eger

1. Safety instructions

- This manual applies only to the track control system argoTrackPilot. It does not apply to the autopilot system (rate of turn control), the rate of turn sensor and indicator, the GPS receiver nor the rudder control system.
- There is no warranty that the tracks delivered with the track control system are free of errors.

The track control system has only one sensor for determining the position and orientation of the ship (GPS compass). If there is an undetected failure of the sensor there may be large deviations from the selected track. Beneath bridges and close to large buildings reception of GPS signals is highly deteriorated and thus the track control system must be monitored carefully.

The track control system is not an autonomous system that reacts to the surrounding traffic. The skipper is fully responsible to comply with the laws and regulations of inland navigation.

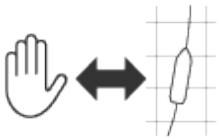
For safe operation of the track control system the following safety instructions must be respected:

- Read the complete manual before activating the track control system.
- Keep this manual at hand for all users of the track control system.

- Make sure the track control system is only used when in perfect technical condition.
- Maintenance and installation must only be carried out by qualified persons.

- **Risk of electric shock or physical damage!**
  Always disconnect power to the track control system before performing any maintenance. Make sure the track control system can not be switched on by accident.

- Follow the local rules concerning accident prevention and environmental protection.
- Follow the general safety instructions of the country where the track control system is used.



- The skipper must monitor the operation of the track control system at all times and switch back to manual control in case of an error.
- At the begin of each trip, the skipper must make sure that switching between track control, autopilot and emergency steering works correctly.
- If an alarm is signaled by the track control system the skipper must switch to manual or emergency steering. The track control system must not be activated again before the cause for the alarm is resolved.

2. General Notes

Although this manual has been written with great care, Argonics GmbH assumes no liability for the consequences of errors in this manual. Argonics GmbH reserves the right to make changes to this manual without notice.

3. Functional Description

argoTrackPilot is a track control system for inland vessels. It is designed to assist the skipper in navigation by steering the ship along pre-defined tracks. The track control system computes the steering commands such that the center of gravity of the ship follows the track with a small cross track error. The steering commands are sent to the autopilot system as desired rate of turn values. The autopilot system sets the rudder angle in such a way the ship turns as required by the track control system. The position, orientation and motion of the ship are measured using a GPS compass together with a rate of turn sensor (gyro).

The track control system features a network interface for inland ECDIS chart displays. The chart display shows the selected track. Using the chart system, the skipper can select other tracks or create new tracks according to personal experience and send them to the track control system.

For passing and meeting of other vessels there is an adjustable offset to the track. The offset is changed using two buttons on the control panel, a third button serves to reset the offset to zero. When an offset has been set a new parallel track is computed by the track control system and displayed in the chart system. The ship will move gradually to the new path.

The track control system is delivered together with a touch screen that displays the most important data of the control system. The skipper can select different configurations of the control parameters for different loading conditions. The touch screen also displays alarms and warnings.

The track control system can be delivered with an optional LTE modem for remote monitoring and maintenance.

Limitations

The argoTrackPilot does an extensive analysis of the sensor data to be able to detect errors of the GPS receiver and the rate of turn sensor. The detection of errors is subject to the technical limitations. Detected errors are displayed on the touch screen, severe errors trigger an additional acoustic alarm. In case of a severe error, the skipper must switch to manual steering.

Since there is only a maximum of two sensors for the measurement of the position and heading of the ship there is no guarantee that every possible error of the sensors is detected. If there is an undetected failure of the sensors there may be large deviations from the selected track. Underneath bridges and close to large buildings reception of GPS signals is highly deteriorated and thus the argoTrackPilot must be monitored carefully.

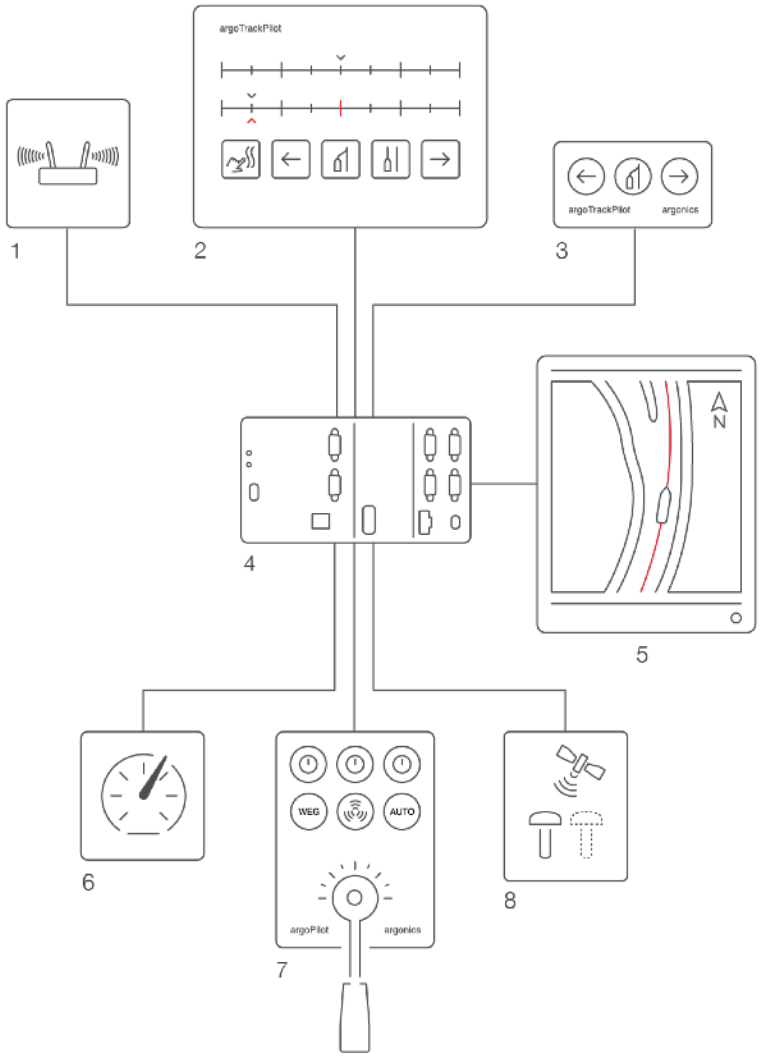
The skipper must monitor the operation of the argoTrackPilot at all times and switch back to manual control in case of an error or erratic behavior of the ship.

The argoTrackPilot is not an autonomous system that reacts to the surrounding traffic. The skipper is fully responsible to comply with the laws and regulations of inland navigation.

4. Scope of Delivery

- Control system argoTrackPilot
- Control panel for table top mounting
- Touch screen 7”
- LTE modem

5. System Overview



1. LTE modem
2. Touch screen / AlphaRiverTrackPilot panel
3. Control panel argoTrackPilot (only argoTrackPilot)
4. Control system argoTrackPilot / PLC
5. ECDIS
6. Rate of turn sensor
7. Autopilot
8. GPS compass

6. Technical Data

Control system / PLC	
Supply voltage	18 V DC ... 32 V DC
Supply current	1,5 A
Ambient temperature	-25 °C ... 60 °C
Storage temperature	-40 °C ... 85 °C
Relative humidity	5% .. 95%
Dimensions	Width: 220mm, Height: 100mm, Depth: 50,1mm
Weight	1,4 kg
Control panel	
IP rating	IP 65
Dimensions front plate	Width: 130mm, Height: 70mm
Dimension for mounting hole	Width: 121mm, Height: 61mm, Depth: 100mm
Weight	0,5 kg
Ambient temperature	-25 °C ... 60 °C
Storage temperature	-40 °C ... 85 °C
Relative humidity	5% .. 95%
Touch screen	
Size	7“
Resolution	800x480px
Power Supply	24V
Dimensions	Width: 222mm, Height: 167mm
Dimension for mounting hole	Width: 197mm, Height: 141mm, Depth: 45mm
Weight	0.85 kg
Ambient temperature	0 °C ... 60 °C (without cooling)
Storage temperature	-20 °C ... 70 °C
Relative humidity	5% .. 95% (without condensation)

Modem	
IP rating	IP 30
Supply voltage	9 V DC ... 30 V DC
Ambient temperature	-40 °C ... 75 °C
Relative humidity	10% .. 90%
Dimensions	Width: 109,6mm, Height: 100mm, Depth: 50,1mm
Weight	280g
Conformity	ES-TRIN 10.20

7. Operation

The track control system is operated using either the touch screen or the control panel.

7.1. Touch screen

The user interface on the touch-sensitive screen can be used to perform all actions that can also be performed via the control element in the console. In addition, alarms and warnings are displayed in detail. The selection of configurations for loading and convoy composition is also carried out via the user interface on the touch-sensitive screen. In addition, some measured values relevant for the TrackPilot are displayed.

After switching on the touch-sensitive screen, a PIN input field opens. After entering the correct number combination and pressing "OK", the graphical user interface opens with the "TrackPilot" subpage.
The subpages of the user interface are selected using the keys on the left of the screen.

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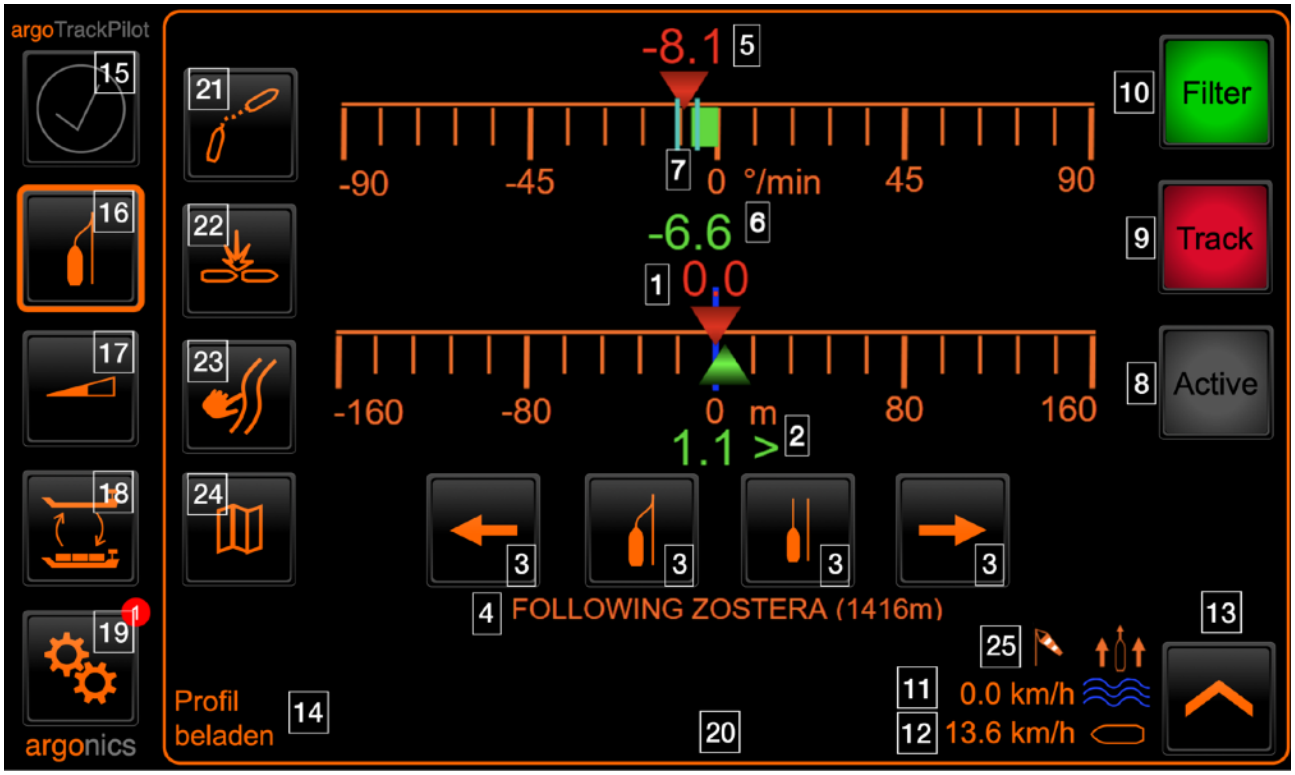
argoTrackPilot

The TrackPilot page shows information about the status of the TrackPilot.

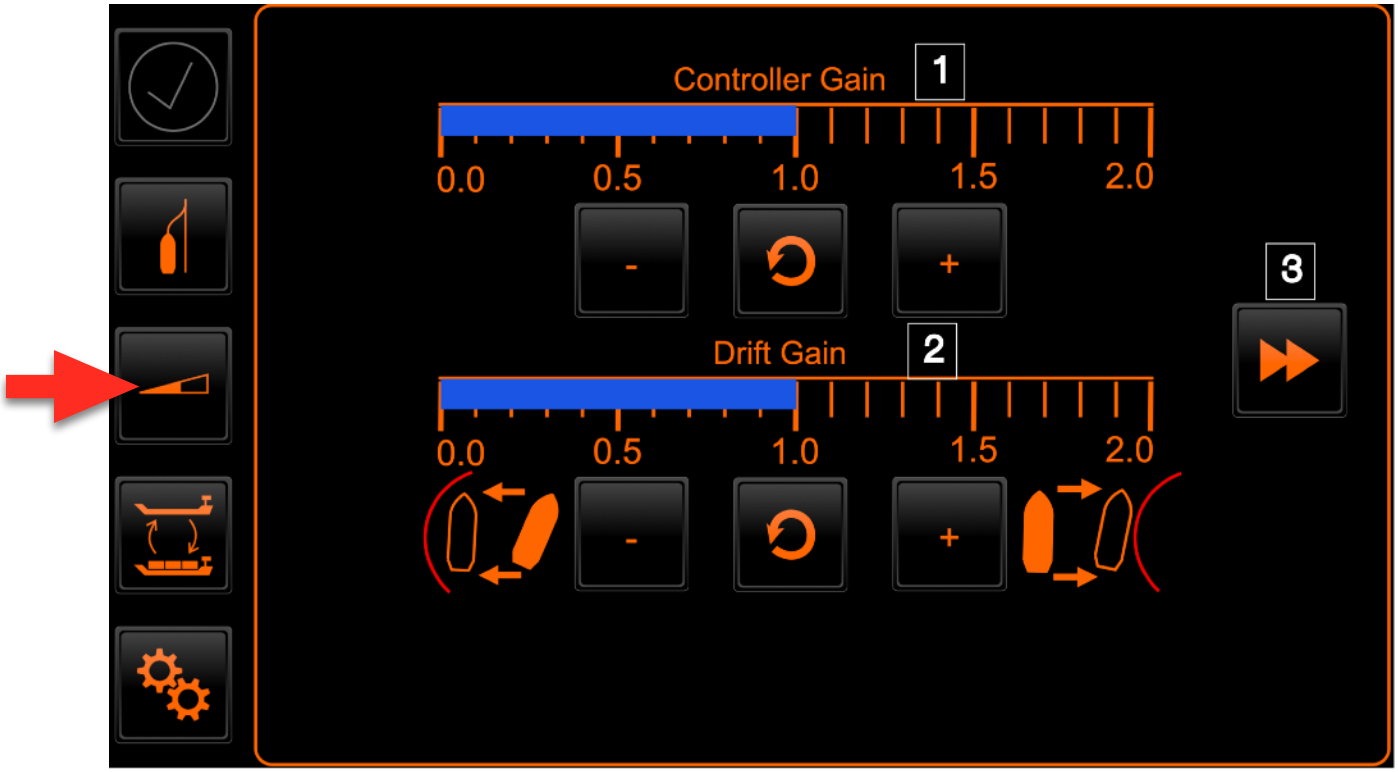


1. Current track offset (distance of the shifted line to the base line): If the red triangle is to the right of the blue marking (blue marking represents track offset = 0), the ship will move to the right of the base line and vice versa.
2. Distance to the shifted line. In this example the ship is 1.1m right of the shifted track.

3. Set the offset of the shifted guideline (see chapter "Moving the guideline")
4. Display of argoTargetPilot targets with name (or mmsi) and the distance (only with active argoTargetPilot)
5. Setpoint from TrackPilot to autopilot. This is a turning rate in ° / min.
6. Turning rate of the ship, in °/min. For a good performance of the system, the turning rate of the ship must follow the setpoint (see 7.) with only little delay.
7. Valid turning rate range for the autopilot of the ship. This means that the turning rate of the ship (green bar) should always be between the two light blue lines.
8. Status light ”Active“ indicates whether the TrackPilot is active. The system can be activated via the "Track" button (not available with some autopilots) or via the autopilot
9. Status light "Track". The system can only be activated if the selected track meets the minimum requirements. This includes a sufficient length and curvatures which are not too large. If this status light is red, the selected track must be checked.
10. Status light "Filter". The system can only be activated if the filter of the measured values can estimate a sufficiently accurate position. A red filter status light indicates that the filter's estimation is insufficiently supported with measurement. After a few seconds in this state, an alarm ("FilterDegraded") will sound in the switched-on state which warns the captain of the insufficient accuracy. A yellow light indicates that one or more readings are out of range. However, the estimate in this state is still sufficiently supported by measurements with a yellow light. A green light indicates correct functioning of the filter. The system can only be switched on with a green filter status light.
11. Speed of the water in km/h and its direction. This has to be set by the scipper via the menu button (13).
12. Speed of the vessel in km/h. If the speed is below 5 km/h, a warning is displayed. The reason for this warning is an insufficient flow of the rudder at low speeds.
13. Button for opening the water speed menu. Besides the water speed the captain has to set the stream direction (with the ship/against the ship).
14. Currently active profile name
15. Alarm symbol indicating the current state of the alarms and warnings. A warning will be signaled with a yellow symbol, an alarm with a red symbol. If there is no warning and alarm a grey checkmark will be displayed.
16. Navigation button to get to the main argoTrackPilot user interface
17. Navigation button to get to argoTrackPilots configuration menu
18. Navigation button to get to the menu for changing the active profile
19. Navigation button to get to other settings like dimming, language etc.
20. Alarm and warning display. Alarms are displayed on the left edge with a flashing red alarm icon. Confirmed but active alarms are displayed with a permanently visible red alarm icon. Warnings are displayed on the left edge with a yellow icon. A flashing symbol indicates a new warning and a permanently visible symbol indicates a confirmed warning. The lower center part of the display shows the time of the last occurrence and the text of the alarm or warning. Warnings are automatically confirmed and go away when the cause disappears. A confirmation of the warnings can also be made by clicking into the text area. You can test the alarm horn by pressing the symbol for more than 5 seconds. The horn will sound as long as the button remains pressed.
21. Optional: Navigation button to get to the user interface of argoTargetPilot. Only available with an active argoTargetPilot license. More information in chapter „argoTargetPilot“.
22. Optional: Navigation button to get to the user interface of argoLaneWarning. Only available with an active argoLaneWarning license. More information in chapter „argoLaneWarning“.

23. Optional: Navigation button to get to the user interface of argoTracks. More information in chapter „argoTracks“ (list view)”.
24. Optional: Navigation button to get to the user interface of argoTracks. More information in chapter „argoTracks (map view)”.
25. Heavy wind setting: When activating the heavy wind setting a symbol will flash on this page to indicate the active status. More details in part „TrackPilot Settings 2“.

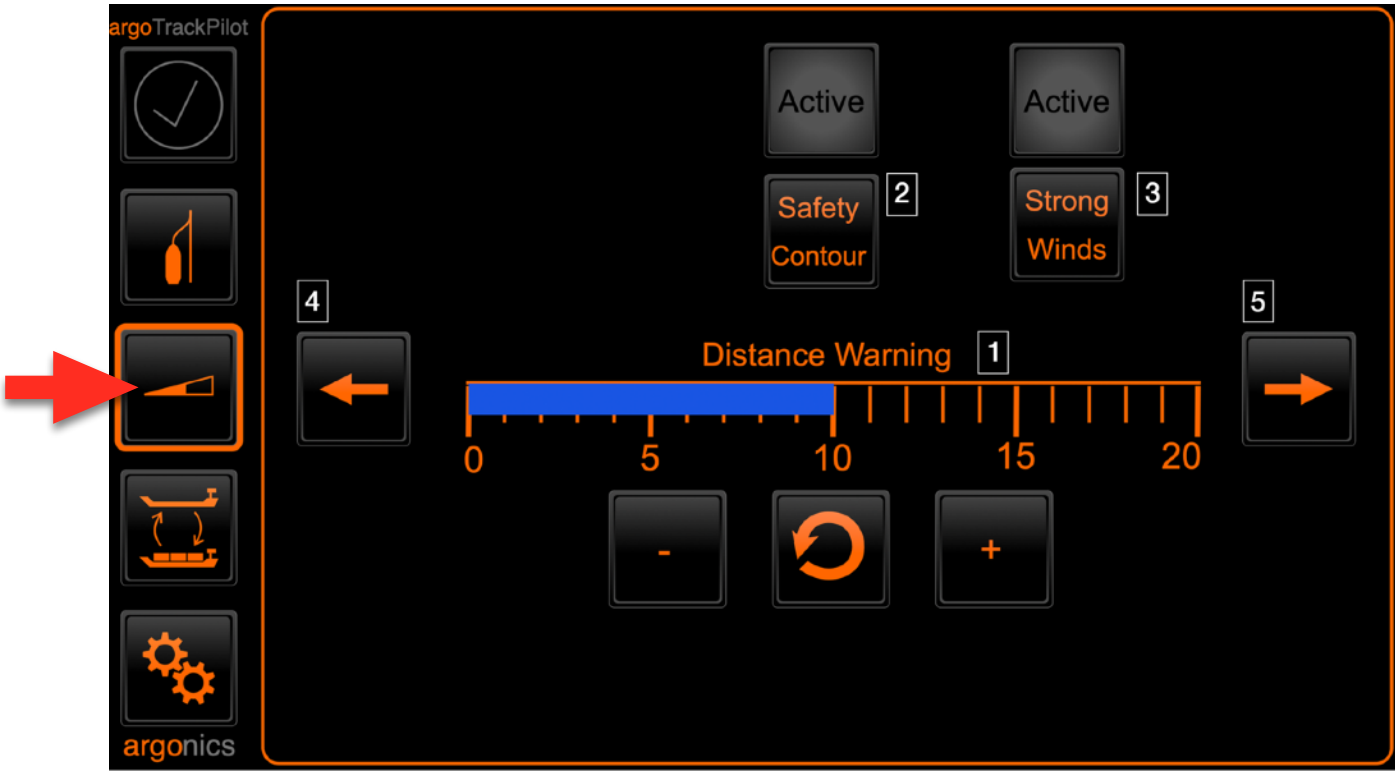
TrackPilot Settings page 1



On the sub-page "TrackPilot settings" important settings of the TrackPilot can be changed. The settings are divided into two – optionally 3 – sub-pages, which can be switched between using the buttons on the right and left edge (3).

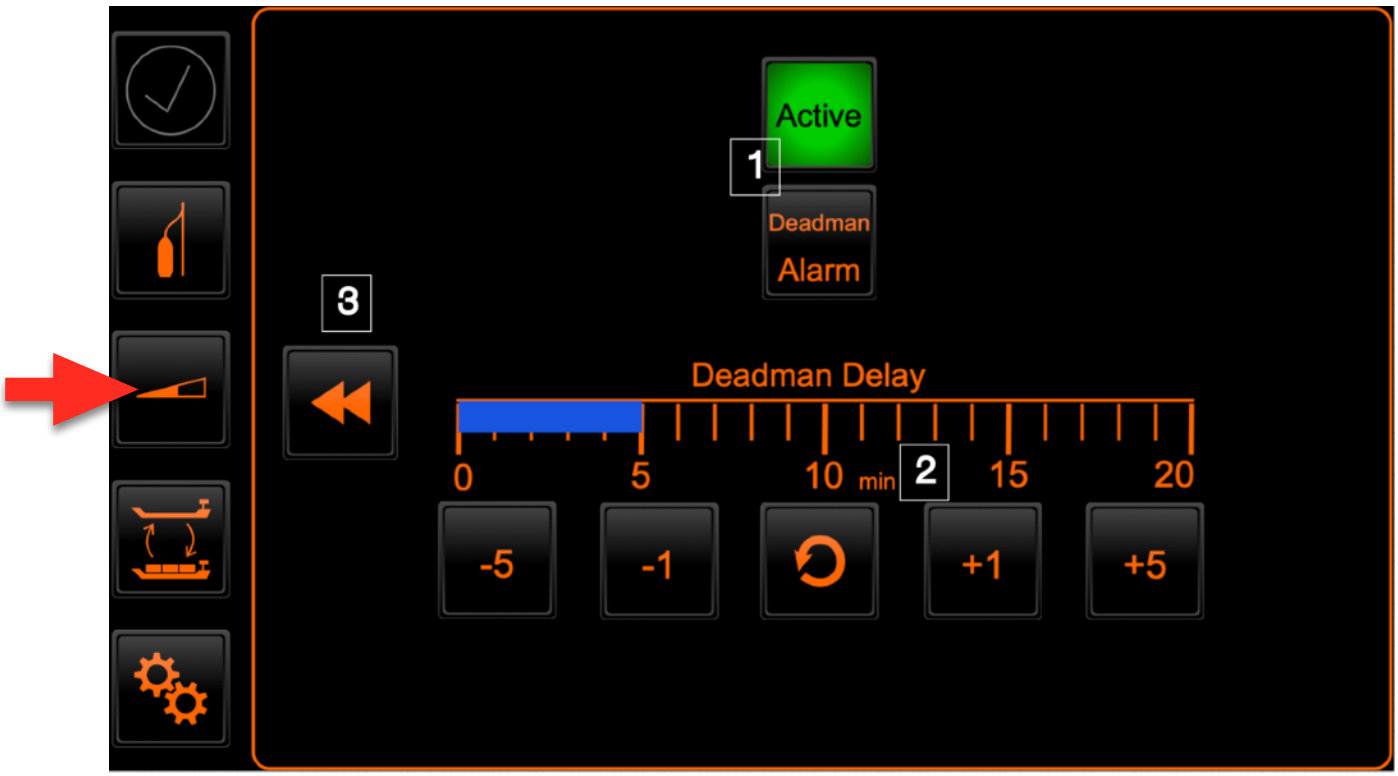
1. Controller gain: This can be varied in several stages from little (left button) to much (right button). A larger value for the controller gain allows the system to be more active at the rate of turn. As a result, deviations from the track can be reduced faster, but the navigation becomes more dynamic due to the increased rudder activity. The selected setting is indicated by a blue bar.
2. Drift gain: The preset settings of the drift factor might not always be the best setting for the current situation. To adjust the drift the captain can lower or raise the drift gain here. Raising the drift gain will increase the drift and move the ship more to the inside of the curve. Lowering the drift gain will therefor reduce the drift and move the ship more to the outside of the curve. The selected setting is indicated by a blue bar.
3. To get to the second page of the settings press this button.

TrackPilot Settings page 2



1. Distance Warning: This can be varied in several stages from little (left button) to much (right button). A larger value for the controller gain allows the system to be more active at the rate of turn. As a result, deviations from the track can be reduced faster, but the navigation becomes more dynamic due to the increased rudder activity. The selected setting is indicated by a blue bar.
2. Safety contours feature: Activates the safety contours feature. This feature is only available when a suitable pair of safety contours is selected.
3. Activates the heavy wind setting. This allows the argoTrackPilot to compensate for large deviations due to wind more freely. The compensation might take a few minutes.
4. To get to the first page of the settings press this button.
5. To get to the third page of the settings press this button.

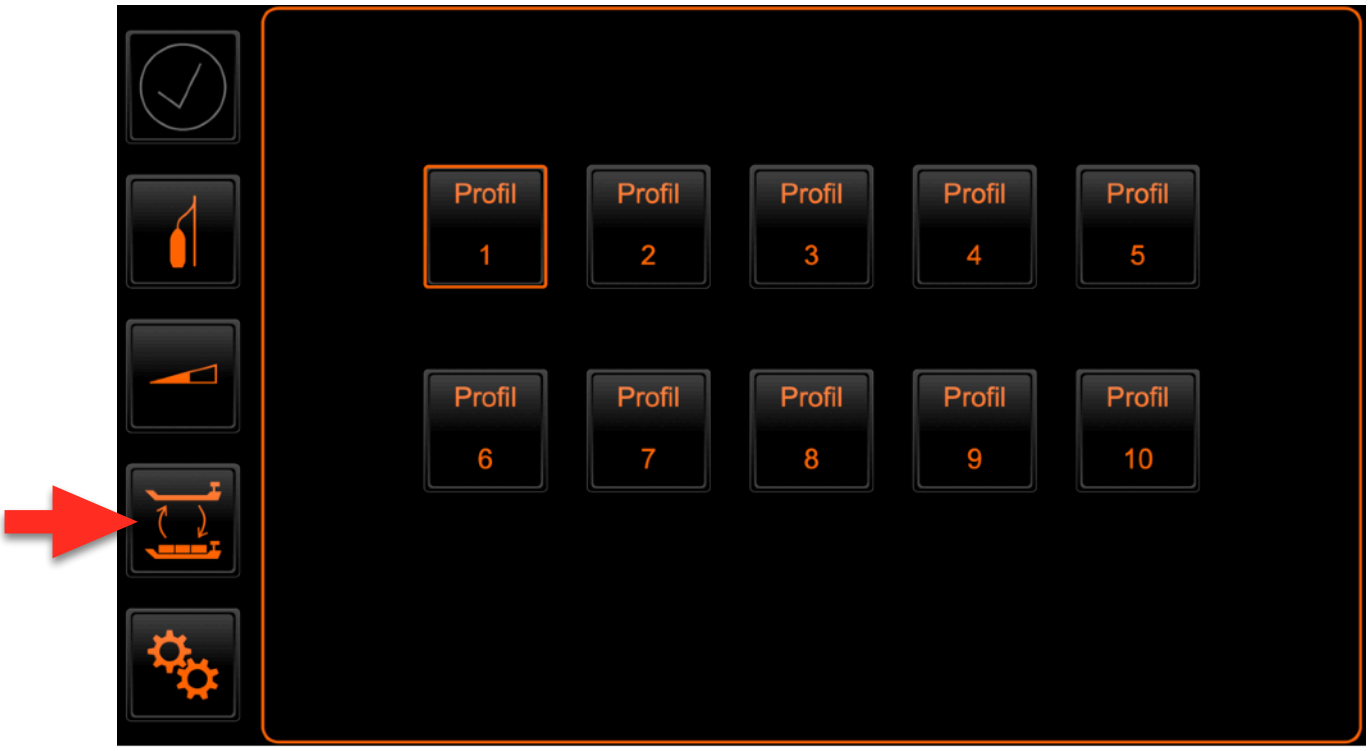
TrackPilot Settings page 3



1. Activating Deadman Alarm: The led displays the status of the deadman warning and alarm. To activate or deactivate the deadman warning and alarm press the button below. If deadman monitoring is active a warning will be displayed and the buzzer will sound after a period of time with no input from the captain while sailing with TrackPilot active. The delay time can be set up with the input under (2). If another 60 seconds after the warning has appeared pass without an input from the captain an alarm will be activated which can only be acknowledged by deactivating the TrackPilot.
2. Deadman Delay: The time before the warning will appear can be set up here. Pressing the +/-1 buttons will change the time by one minute. Pressing the buttons +/- 5 will change the time by 5 minutes. To reset it to 10 minutes the middle „reset“ button can be pressed.
3. To get to the second page of the settings press this button.

Profiles

On the page „profiles“ which can be reached with the button shown in the picture above different predefined settings can be loaded. The active profile is shown with a frame around the corresponding button.



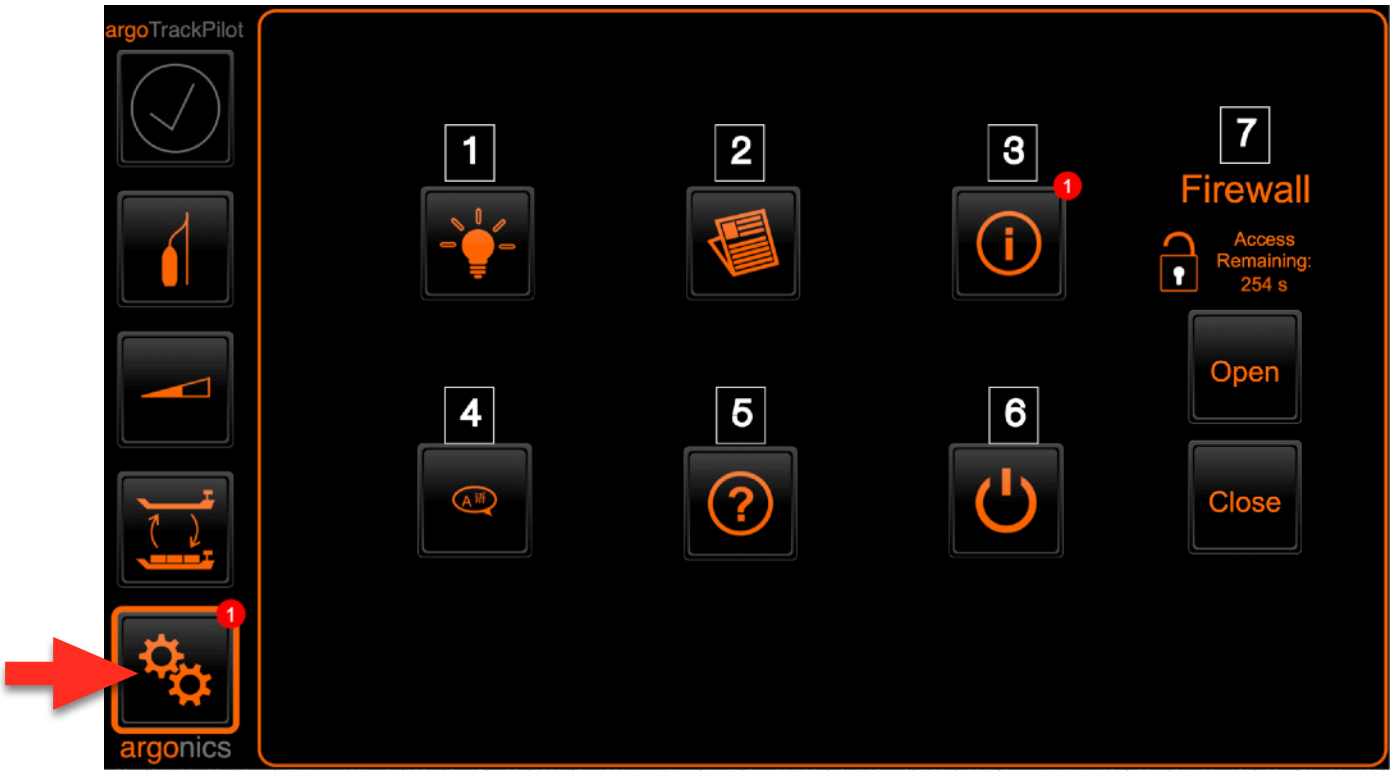
The selected profile is also displayed on the "TrackPilot" page in the lower left area.

During active driving with the argoTrackPilot, the profile cannot be changed. In this case the buttons are greyed out.

A maximum of 10 preset profiles can be created. Profiles that have not been set are no longer displayed in the user interface as of version 2.3. If you need more profiles than what was initially set up please contact argonics customer support.

Miscellaneous Settings

With the settings (gears) button on the left of the page the miscellaneous settings can be opened.



The following settings can be changed:

1. Brightness: Opens a menu to set the brightness and color scheme of the touch display. The brightness of the buttons built into the control panel can also be changed here.
2. News: Opens the latest news regarding software updates or changes to the TrackPilot. The system checks daily if there are any news and downloads them automatically. If this is the case, a new message is displayed at the bottom left of the button for switching to the settings page.
3. About: This button can be used to display the system name, version and CPU utilisation of the TrackPilot system. The note at the top right corner of the button indicates that a new software version is available for the TrackPilot. The update can be performed after pressing this button.
4. Language: The language setting can be changed here. The languages German, English and Dutch are available. If a permanent setting of a specific language is desired, this must be done elsewhere. Please contact the Argonics customer support.
5. Help: Pressing this button takes you to a sub-page with a redirect to the service homepage and the contact information of the customer support.
6. Reboot: After updating the TrackPilot or when problems with the touch display occur restarting the display is necessary. The graphical user interface will come back automatically after rebooting the touch display. This button only reboots the touch display. The TrackPilot is not affected by rebooting the touch display. This process can take up to a few minutes.
7. Firewall: The firewall installed for operational security can be operated via the two buttons "Open" and "Close". Pressing the "Open" button deactivates the firewall and allows connections for remote maintenance etc. To reactivate the firewall, the "Close" button must be pressed for a few seconds. A small bar above the button indicates the closing process. The status of the firewall is shown above the two buttons. The lock symbol represents whether the firewall is open or closed. If the firewall is open, the remaining time is also displayed. After the time has expired, the firewall is automatically closed again.

Filter - Select - Activate

What is the difference between filter, select and activate?

1. Filter
   We provide you with filters so you don't have to browse through all the available tracks from A to Z. You can filter the tracks in different ways, e.g. by "last activated" or "in my immediate vicinity". List view and map view provide different filters.
2. Select
   1. List view: Use the arrow keys to scroll through the listed (and filtered) tracks. You select the desired track by clicking on its name. If a track is selected, it has an orange frame (see graphic under "List View").
   2. Map view: Use the arrow keys to scroll through the filtered tracks. As soon as the name of the track appears at the top of the free field (9), it is selected.
3. Activate
   Clicking on the checkmark symbol activates the track. It is loaded and can be used.

List view

Pressing the button (23)  on the main page opens the sub-page “argoTracks-Service” in its list view.

The buttons on this page have the following functions:

1. Downloading new tracks from the server.
   An error during download can have different reasons. Try again at a later time. If a successful

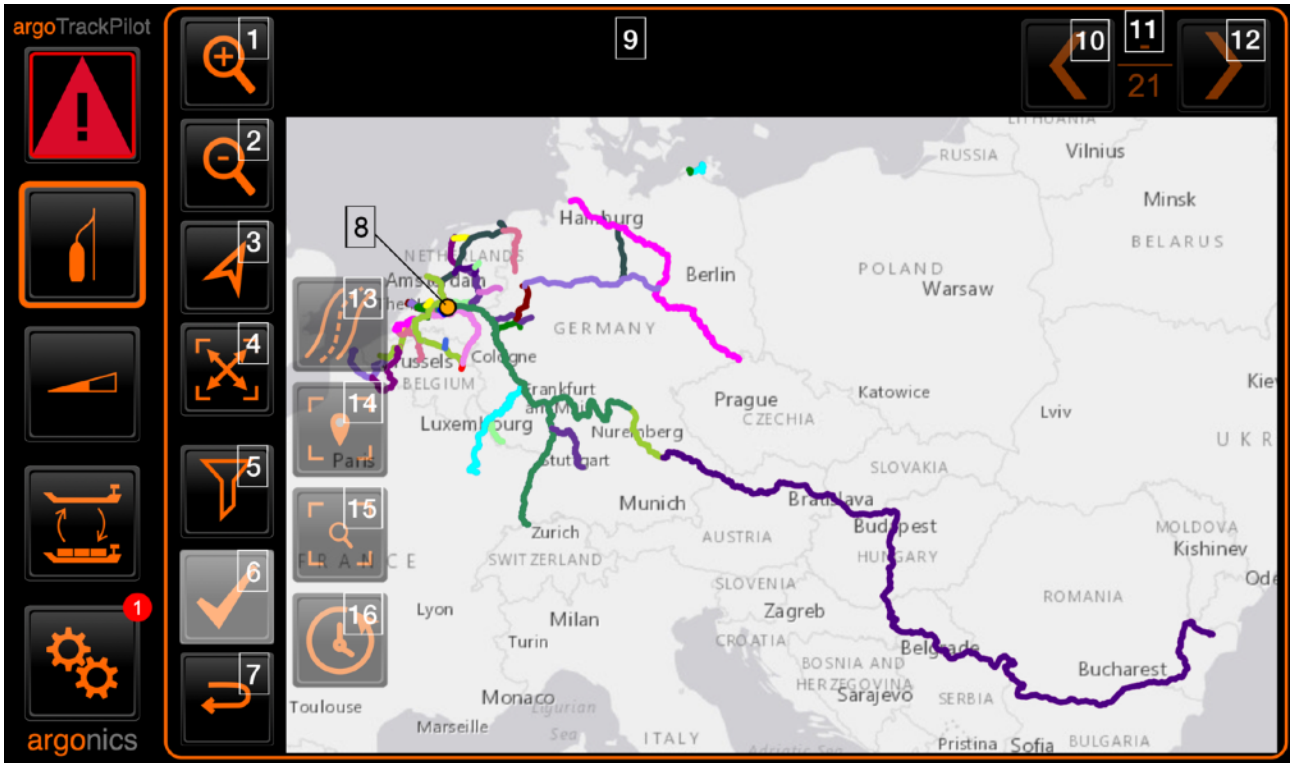
connection could not be established after several attempts, please contact Argonics customer support.

2. Filter: Alphabetical
   Displays the list divided into five sections of the alphabet. To deactivate the filter, press the filter button again.
3. The arrow keys up and down can be used to scroll through the list. Below the buttons, the current page and the total number of pages are displayed.
4. List of locally saved tracks.
   Displayed are only tracks which are saved inside argoTrackPilot. If a track is greyed out, the usage time has expired. Please contact the Argonics customer support.
   To preselect a track, please press the respective area. The selected track is now displayed with an orange frame, but is not yet activated.
   For each track the following details are displayed if available:
   1. River or start to end point
   2. Direction (only for rivers)
   3. Waterlevel (if available)
   4. Miscellaneous informations like version, type, etc.
5. Activating the selected track: To activate the selected track, the TrackPilot must be deactivated. The successful loading of the track is displayed. Also check the correct selection of the track in the connected ECDIS.
6. Switch the display back to the main screen.
7. Filter: Last activated tracks
   This button switches the display to the 5 most recently used tracks. The list is sorted by time.

For displaying an overview of all tracks and selecting a track via an external PC please read chapter 7.7.

Map view

The button (24)  on the "TrackPilot" page takes you to the "argoTracks-Service" subpage in the map view.



1. Zoom in – Zooms in on the map section.
2. Zoom out – Reduces the map section.
3. Centre view on own position (orange circle (8))
4. Restrict map section to selected track
   The map section displayed adapts to the selected track. If no track is selected, the map section is selected so that all tracks can be displayed in their total length.
5. Filter options for track selection
   If you have not yet applied a filter option, the symbol represents a filter. Click on it to open further filter options on the right (13, 14, 15, 16).
6. Activating the selected track: To activate the selected track, the TrackPilot must be deactivated. The successful loading of the track is displayed. Check the correct selection of the track also in the connected ECDIS.
7. Switch the display back to the main screen.
8. Own position in the map view (orange circle)
9. Name of the selected track
10. Use the left (10) and right (12) arrow keys to scroll through the tracks. In the centre (11) the current track and the total number of tracks are displayed.
11. Numbering of tracks
    If you have selected several tracks in one area, the current track and the total number of selected tracks are displayed here.
12. You can scroll through the tracks with the arrow keys left (10) and right (12).

13. Filter: Active track
14. Filter: Tracks in my direct vicinity
15. Filter: tracks in current section
16. Filter: Recently activated tracks

Customizing the map section

When you first open the map view, all available tracks are displayed.

The map can be moved by clicking in the map area. The Zoom In (1) and Zoom Out (2) buttons can be used to further adjust the displayed area. Alternatively, you can also use the button (3) to quickly center the map view on your own position.

The button (4) adjusts the displayed map section to the currently selected track. If no track is selected, the map section is selected so that all tracks are displayed.

Filtering and selecting tracks

Filtering

If you have not yet applied a filter option, then the symbol (5) represents a filter.
If you click on the filter, the following filter options open on the right (13, 14, 15, 16):

Filter: **Active track** (13)
If a track is already active, this filter centers the view on it. The track is displayed in its total length.

Filter: **Tracks in my direct vicinity** (14)
This filter displays all tracks in the direct vicinity of your position. This function is useful if you want to see all tracks that run through the river or harbor you are currently navigating. The filter area is displayed as a red frame.

Filter: **Tracks in current section** (15)
This filter displays all tracks that are located in the current section of the map.

Filter: **Recently activated tracks** (16)
This button switches the display to the 5 most recently used lines. The list is sorted by time.

Selecting

Once you have applied a filter, an overview (11) of the total number of available tracks appears in the upper right corner. You can now scroll between them with the arrow keys (10, 12). The map view adjusts accordingly.

As soon as a track is selected, its name appears in the upper, free area (9).

Activating a track

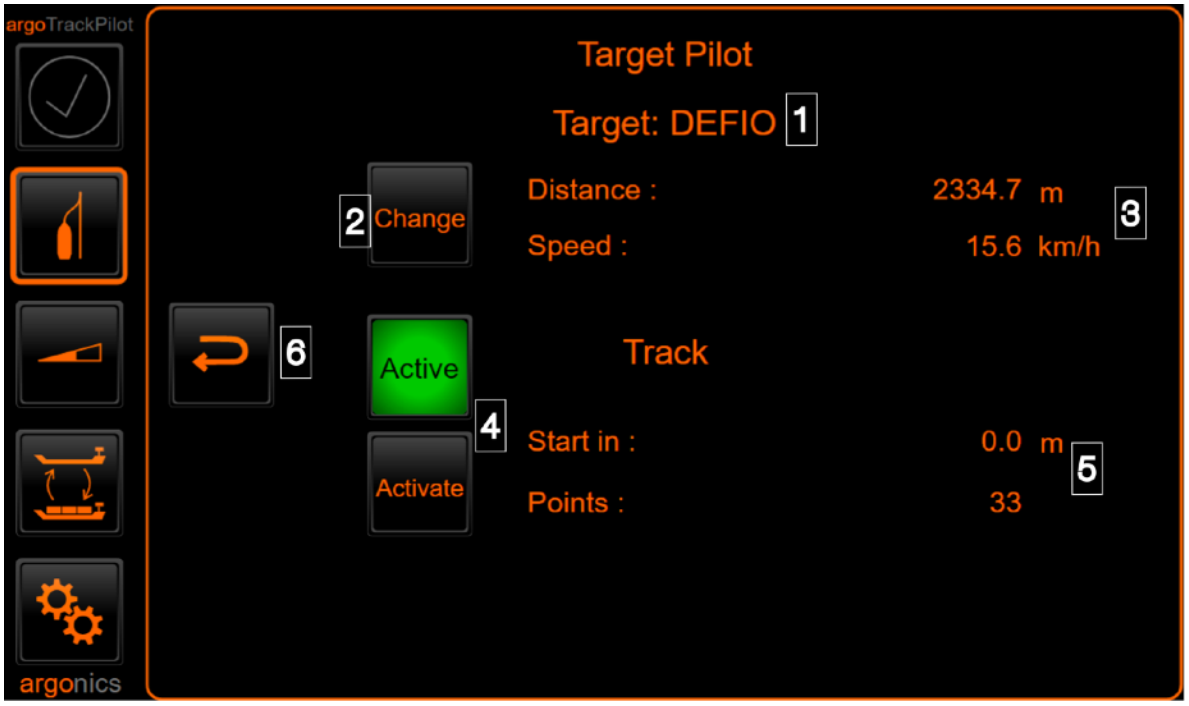
To activate the selected track, the TrackPilot must be deactivated. The successful loading of the track is displayed. Check the correct selection of the track also in the connected ECDIS.

Press the "Activate track" button (6)  to activate the track you have selected.

The "Back" button  takes you back to the main screen.

argoTargetPilot

Pressing the button with the symbol  on the main page opens up the user interface for argoTargetPilot.



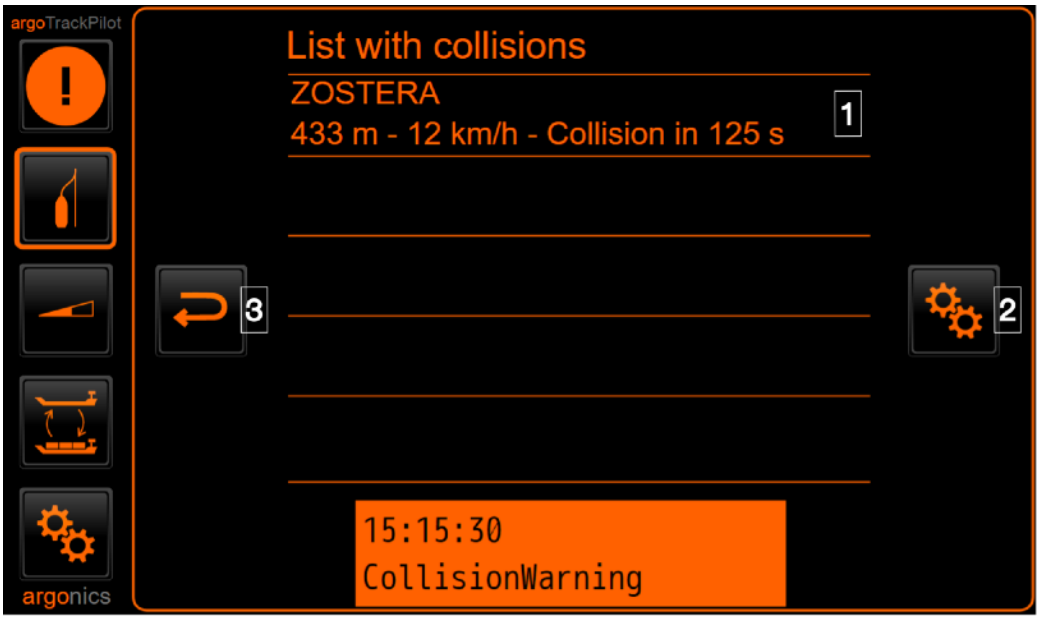
The elements have the following meaning or function:

1. Display of the currently selected target: If the argoTargetPilot does not yet have a name, the MMSI is shown here instead.
2. Change the selected target: Pressing this button opens up a list with all available ships. All AIS targets within a 4km radius are filtered according to speed and course. Only those ships are displayed in the list that have a similar course and a speed greater than 5 km/h.
3. Data for the selected AIS target: The data includes the current distance to the target along the recorded path and the current speed of the target.
4. Activate argoTargetPilot: The status light "Active" indicates whether the recorded track is currently selected for automatic travel with the argoTrackPilot. To change the status, the argoTargetPilot can be activated and deactivated using the "Activate" button.
5. Data for the recorded track: The number of recorded points is shown next to "Points". "Start in" specifies the distance from the current position to the beginning of the recorded track.
6. Back to main page.

For more information about operation and limitations please refer to section “7.5. argoTargetPilot".

Collision warning (argoLaneWarning)

Pressing the button with the symbol  on the main page opens up the user interface for collision warning. From there, another button takes you to the settings page for the collision warning.



The elements have the following meaning or function:

1. Display of active potential collisions. All potential collisions are displayed with the distance to the target, its speed and the time to potential collision.
2. Opens up the settings for collision warning.
3. Back to main page.

On the settings pages the following parameters can be changed:

- De- and activate the collision warning system
- De- and activate the acoustic warnings
- De- and activate the acoustic alarms
- Additional width which will be added to the safety corridor around the track
- Threshold warning for distance and time to collision
- Threshold alarm for distance and time to collision

For more information about collision warning and its functions please refer to section "7.6 argoLaneWarning".

7.2. Control panel for desk installation

There are multiple variants of this control panel.

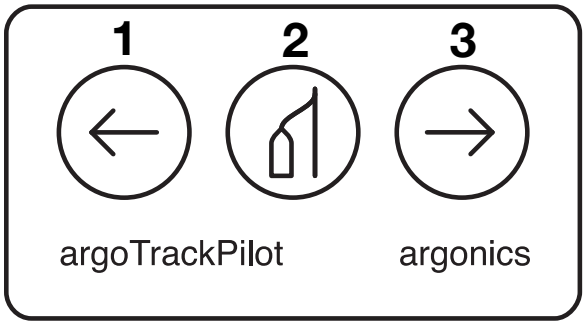
Variant 1: The control panel has 4 buttons (1-4), which can be pressed, one selector switch (6) and one alarm horn (5).

Variant 2 only features the buttons 1-3.

The elements have the following functions:

1. Moving the track to port side
2. Moving the track back to the center (offset = 0)
   From software version 2.2 and newer the function of this button has changed.
   1. When pressing the button shortly the current distance will be set as desired distance
   2. When pressing the button for 2 seconds the desired distance will be reset to 0.
3. Moving the track to starboard side
4. Switching TrackPilot mode on, status light active (not available when using Alphatron or RadioZeeland systems)
5. Alarm horn. Should the control panel only contain buttons 1-3, warnings and alarms are indicated via a built-in buzzer.
6. On/Off switch (only with argoPilot)

Variant 1: Four lighted buttons, warning buzzer and a rotational switch



Variant 2: Three lighted buttons and a built-in buzzer

7.3. Switching the system on and off

To activate the TrackPilot, there are different methods. These depend on which autopilot is connected to the TrackPilot.

Below you will find instructions for the different manufacturers.

7.3.1. Argonics argoPilot

TrackPilot mode is activated by pressing the "Bahn" button [4]. The following conditions must be fulfilled for this:

- Selector switch "On / Off" [6] in position "On"
- Track condition ready (see "Display TrackPilot")
- Filter condition ready (see "Display TrackPilot")

If the selector switch is turned to the "off" position while the system is active, the system remains active until it is deactivated via the autopilot. However, the function of the argoPilot may be impaired. Please consult your installation technician.

7.3.2. Alphatron AlphaPilot

TrackPilot mode is activated by pressing the "compass" button on the AlphaPilot control. The following conditions must be fulfilled for this:

- Track condition: ready (see "Bottom TrackPilot")
- Filter condition: ready (see "Bottom TrackPilot")
- Lever of the AlphaPilot in zero position (depending on autopilot setup)

After pressing the button the pilot will sound a short beep. If all devices are functioning correctly, only a short beep sounds and the TrackPilot controls the ship. A not stopping beep indicates that the autopilot is not receiving feedback from the TrackPilot about the navigation status. The TrackPilot can not be activated at this time.

7.3.3. RadioZeeland Sigma/Titan

TrackPilot mode is activated by pressing the external button on the RadioZeeland control. The following conditions must be fulfilled for this:

- Track condition: ready (see "Bottom TrackPilot")
- Filter condition: ready (see "Bottom TrackPilot")

A beep from the autopilot after pressing the external button indicates a malfunction of the system and the TrackPilot can not be activated at this time. The beep warns that the autopilot is not receiving feedback from the TrackPilot about the navigation status.

7.3.4. Veth Autopilot

TrackPilot mode is activated by pressing the „Bahn“ button [4] on the control panel. It is also possible to activate TrackPilot mode with the button „Bahn“ (7) on the graphical user interface (see ”Display TrackPilot“). The following conditions must be fulfilled for this:

- Track condition: ready (see "Bottom TrackPilot")
- Filter condition: ready (see "Bottom TrackPilot“)
- Autopilot im Modus „AUTO“

A beep from the autopilot after pressing the button indicates that the system is malfunctioning and the TrackPilot can not be activated at this time.

7.3.5. Schwarz RiverPilot

TrackPilot mode is activated by pressing the „Bahn“ button [4] on the control panel. The following conditions must be fulfilled for this:

- Track condition: ready (see "Bottom TrackPilot")
- Filter condition: ready (see "Bottom TrackPilot“)
- Autopilot im Modus „AUTO“

A beep from the autopilot after pressing the button indicates that the system is malfunctioning and the TrackPilot can not be activated at this time. The beep warns that the autopilot is not receiving feedback from the TrackPilot about the navigation status.

The illumination of the "Bahn" button and the "Bahn" light on the user interface indicates that the TrackPilot has been successfully **turned on**. If the lights are not turned on despite pressing a button, the ship must still be controlled manually.

CAUTION

Checking the function

After switching the TrackPilot on, the skipper must check whether the TrackPilot actually controls the ship in the desired manner and whether the autopilot correctly implements the control commands.

➢ Read the chapter “Sea trial” in the installation manual.

Switching off the TrackPilot is done via a button on the autopilot, which switches the autopilot back to "AUTO" mode. This is named differently depending on the manufacturer. When the command is given to the autopilot, the "Bahn" light on the control panel and in the user interface goes out.

One exception is the Veth autopilot. On this autopilot, the TrackPilot mode must be deactivated on the TrackPilot. This is done by pressing the "Bahn" button (7) on the user interface again. It is also possible to switch the mode to "WEG" on the autopilot in order to regain control of the rudder on the autopilot.

7.4. Moving the track

For overtaking and evasive maneuvers, the skipper can move the track to both sides transversely using buttons 1 and 3 of the control elements. Button 2 resets the offset back to the original track. To continually shift the track, keep key 1 or 3 pressed.

CAUTION

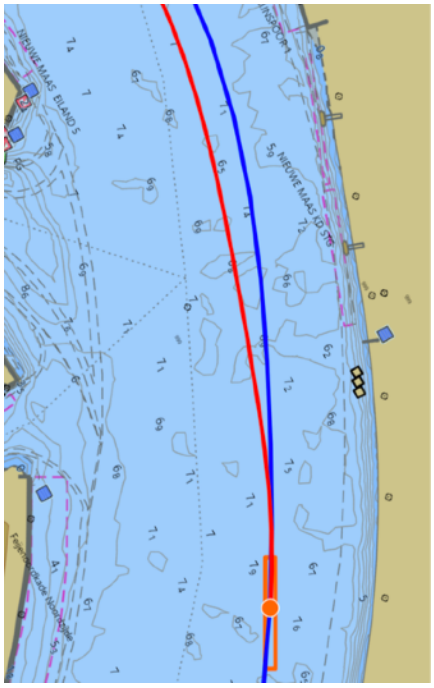
Checking the function

The moved track may run outside the fairway and dangerous encounters may occur.

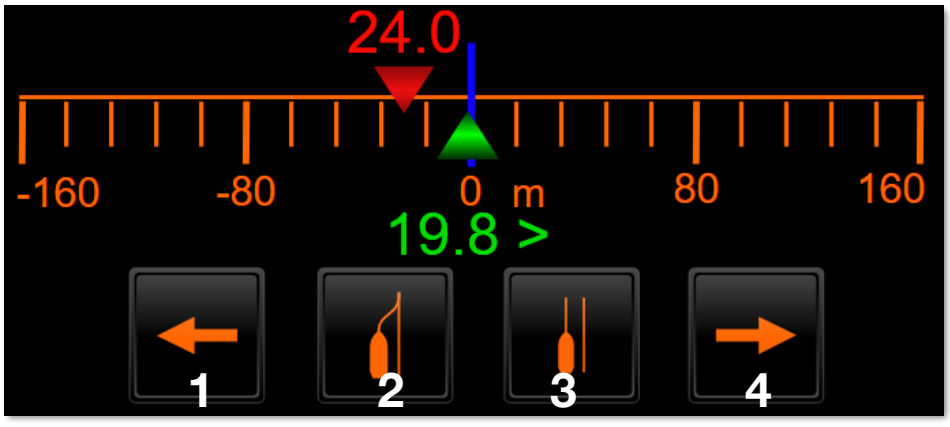
➢ Check the track using the connected chart display and adjust it, if necessary.

From software version 2.6 the red line will be displayed as a transition from the current position towards the shifted track.

Moved track with transition (red) and original track (blue):



On the touch screen, the shift is displayed on a scale as a red triangle (here 24.0m), the current distance to the shifted track is represented by a green triangle (here 19.8 m):



You will also find buttons for moving (1,4) and for resetting (2) the offset on the touch screen. The distance at which the track moves can be set in the configuration menu. Contact the customer service or the installer.

In addition, the current distance can also be selected as a track offset (3).

7.5. argoTargetPilot - automatic following of AIS targets

argoTargetPilot is an additional module to argoTrackPilot and can be purchased separately. The function enables the automatic following of AIS targets in front.

Connection to an AIS transponder is a prerequisite for using argoTargetPilot. If this connection has not yet been installed speak to your navigation electronics specialist. Please contact argonics customer support for more information.

CAUTION

Responsibility of the skipper

The skipper is responsible for the vessel and its course at all times.

➢ Do not leave the helm.

➢ Never allow the argoTrackPilot to steer the vessel without supervision.

NOTICE

Unreliable AIS information

Only AIS information is used as a basis for the subsequent voyage. These AIS positions may be inaccurate and unreliable. The resulting path may possibly lead through unnavigable places.

➢ Increased caution is required when using the argoTargetPilot.

➢ In particularly narrow and curvy areas, the argoTargetPilot should only be used with extreme caution.

User interface argoTargetPilot

To get to argoTargetPilot's user interface press the button with the symbol  on the main page of the user interface.

The following page opens up with all necessary information about argoTargetPilot.

Information on the selected target is shown in the upper part of the page:

- Name or MMSI if name is not available
- Distance to target along the selected track
- Target's current speed

If, as here, no destination is selected, all information of the destination is "0.0".

The destination can be changed by pressing the "Change" button. You can find more on this in the section "Selecting a destination".

The lower section of the page shows information about the recorded track of the target:

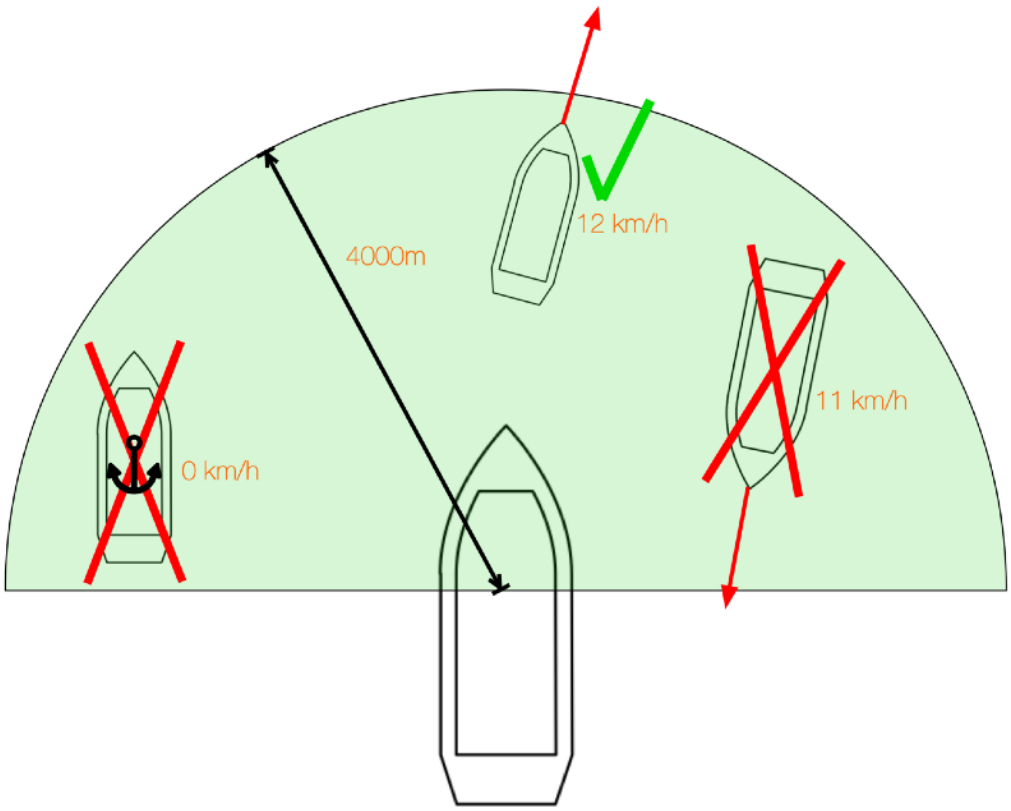
- Start in: Distance to the start of the track recorded from the target. argoTargetPilot cannot be activated before the start of the track is reached. The display is outlined in yellow before the target's track is reached.
- Points: The number of track points recorded from the target. If there are not enough points yet argoTargetPilot cannot be activated. The "Start in" display then shows the value "9999".

The button with the status light for deactivating or activating the argoTargetPilot is located on the left side of the user interface. Pressing the "Activate" button switches the active track to the track recorded from the target if all requirements are met. When the argoTargetPilot is deactivated the track which was selected prior to activating argoTargetPilot is activated again.

Selecting a target and activating argoTargetPilot

In order to keep the list of AIS targets short all targets are filtered.

The targets are filtered as follows:



- Distance to target: max 4000m (green semicircle)
- Direction to target: +- 90° relative to own heading (green semicircle)

- Targets' course over ground: +- 90° relative to own course over ground
- Velocity of target: at least 5 km/h

The ships in the green semicircle are filtered according to the rules mentioned above. The ship at the left edge is anchored. Thus, its speed is too low. The ship on the right-hand side travels against the own direction of travel and is also filtered out. Only the ship in the upper part of the picture fulfills all conditions and can be selected as a target for argoTargetPilot.

In order to select a target argoTrackPilot must be deactivated. The list of possible targets can then be displayed using the "Change" button on the main argoTargetPilot interface.

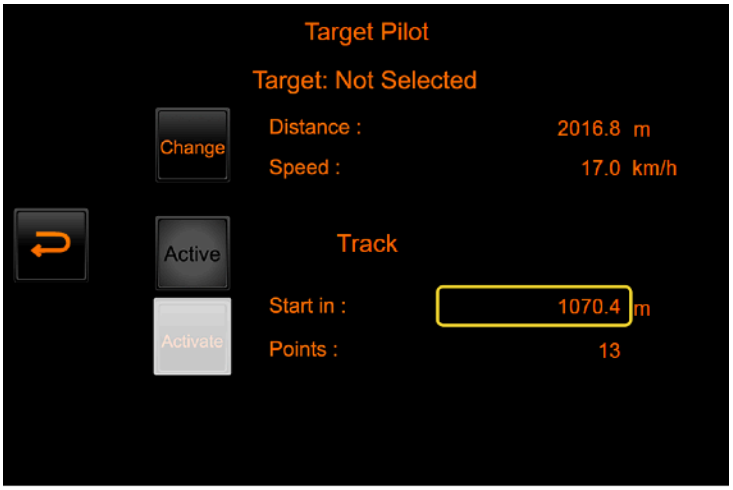
If a target has already been selected it will be shown in the list with an orange frame. In addition to the name (or MMSI) of each target, the distance and the current speed are also displayed. If a name has not yet been received for a target its MMSI is displayed instead.

To select a target press the corresponding entry in the list. The button in the top right corner with the "X" can be used to deselect the current target.

The button with the reload symbol is used to update the list.

To scroll through the list use the buttons with the up and down arrow.

After selecting a target, the list is automatically closed and all information relating to the target is displayed in the main interface of argoTargetPilot.



If the distance to the start of the recorded track is 0 and argoTrackPilot is not active argoTargetPilot can be activated with the „Activate" button. When activating argoTargetPilot the currently active track is switched to the recorded track of the AIS target. argoTrackPilot can then be used with the recorded

track. On the main page of argoTrackPilot a message is displayed that an AIS target is being followed. See number (4) of the main argoTrackPilot page.

7.6. argoLaneWarning - collision warning based on AIS

argoLaneWarning is an additional module to argoTrackPilot and can be purchased separately. The function enables collision warning based on AIS information. argoLaneWarning **supports** the skipper by providing collision warning based on AIS and thus contributes to increasing safety while sailing with argoTrackPilot.

Connection to an AIS transponder is a prerequisite for using argoLaneWarning. If this connection has not yet been installed speak to your navigation electronics specialist. Please contact argonics customer support for more information.

CAUTION

Failure to warn when argoTrackPilot is deactivated

argoLaneWarning can only warn while sailing with activated argoTrackPilot. If the argoTrackPilot is deactivated, there is also no warning of collisions.

➢ Make sure that the argoTrackPilot is activated.

NOTICE

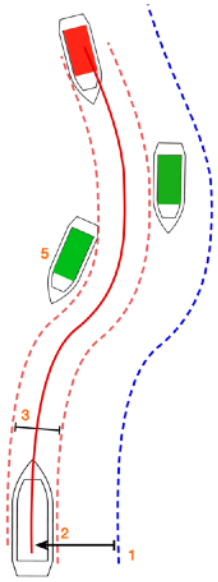
Unreliable AIS information

argoLaneWarning only uses AIS information to detect targets. This AIS information can be inaccurate and unreliable. Furthermore, not all possible obstacles are equipped with AIS transponders. argoLaneWarning may therefore produce incorrect warning messages or not warn at all.

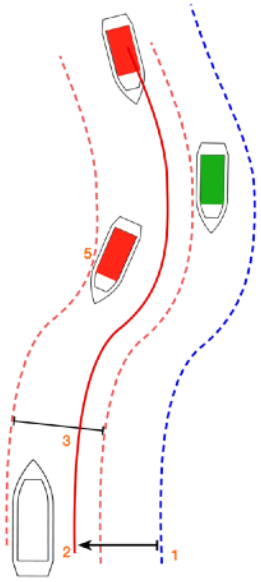
➢ Continue to observe vessel traffic carefully.

Collision detection

In order to detect a potential collision argoTrackPilot compares the position of all AIS targets with the currently selected track. The following schematic illustration clarifies which targets are recognized as potential collisions (red) and which are not (green).



Sailing on the red line



Detection when sailing with distance to the red line

For the prediction of the own position it is assumed that argoTrackPilot steers the ship to the red line (2) which can be shifted with respect to the base track (1). Accordingly, only the area around the red line is checked for possible collisions. The width of the ship plus an adjustable lateral safety distance is set as safety corridor around the red line (3). The current distance to the red line is added to the safety corridor which is checked for potential collisions. In the illustration on the right the corridor (3) around the red line is wider to port side than to starboard side. The time to collision is calculated for all vessels within this safety corridor. Their length and width as well as additional width due to drift is taken into account. If the time to collision of any ship violates the time to collision warning threshold a collision warning becomes active. If the time to collision of any ship violates the time to collision alarm threshold a collision alarm becomes active.

In addition, the longitudinal distance to all AIS targets is checked at all times. If this distance violates the distance warning threshold a collision warning becomes active. If this distance violates the distance alarm threshold a collision alarm becomes active. The threshold settings can be modified in the configuration interface of argoLaneWarning. More on this in the section "Configuration of argoLaneWarning".

All ships are presumed to be aligned with the selected track of argoTrackPilot because AIS does not provide heading information for many ships. Thus, potential collisions with ships which are not aligned with the track direction of argoTrackPilot cannot be detected reliably.

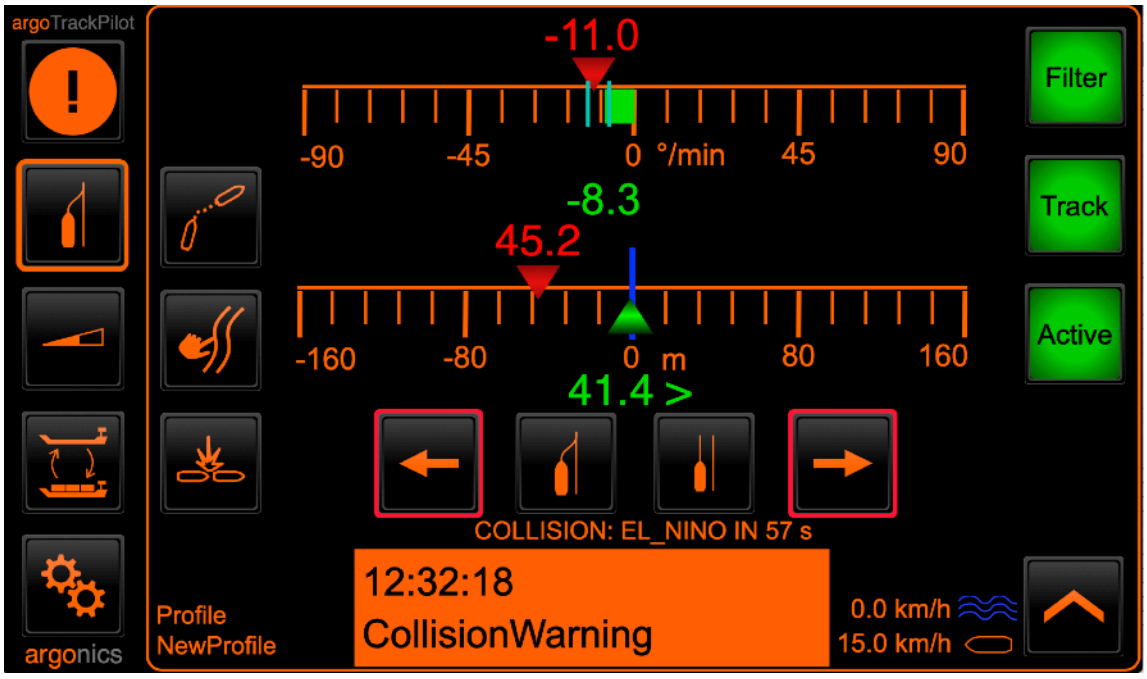
WARNING

Possible collision with cross traffic

The argoLaneWarning system assumes that traffic always moves in the direction of its own track. It therefore does not warn of possible collisions in cross traffic.

➢ Continue to observe the vessel traffic carefully.

On the main page of argoTrackPilot potential collisions are indicated. The settings can be adjusted via the configuration interface of argoLaneWarning. More on this under "Settings for collision detection". If a potential collision has been detected the following information can be found on the main page:

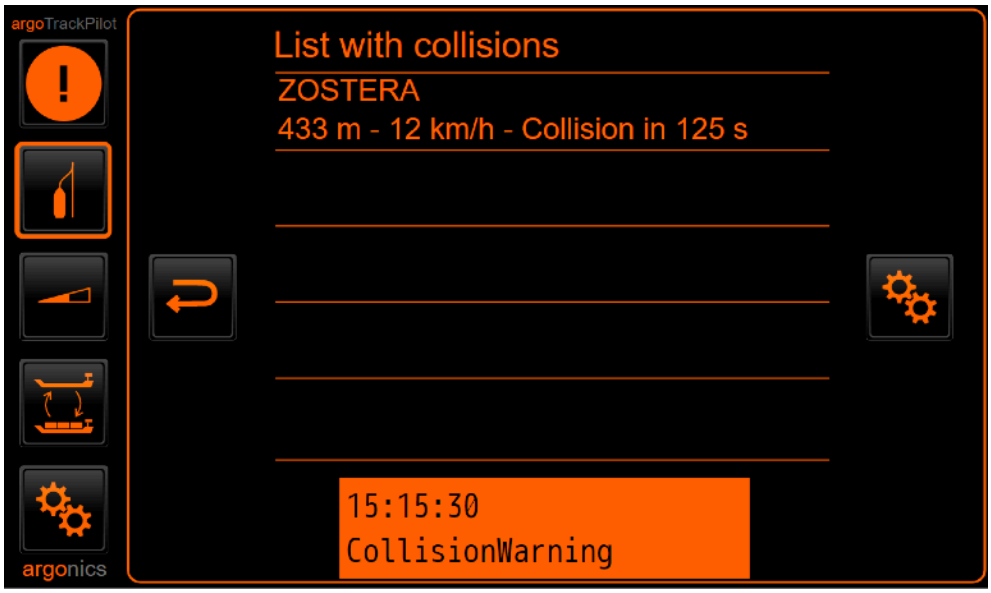


If a potential collision is detected there is an indication of the vessel (name or MMSI) with which a collision is imminent and the time until collision in seconds. In addition, red frames flash around the two buttons for moving the track. These frames are intended to suggest a possible reaction to the warning.

When the warning is activated a visual warning “collision warning” appears as well as an acoustic warning in the form of two short beeps from the alarm horn which is repeated every second.

List with possible collisions

Since the main page of the TrackPilot only warns of the next potential collision there is a complete list of all detected potential collisions. With a press on the button with the symbol  the following list can be displayed:

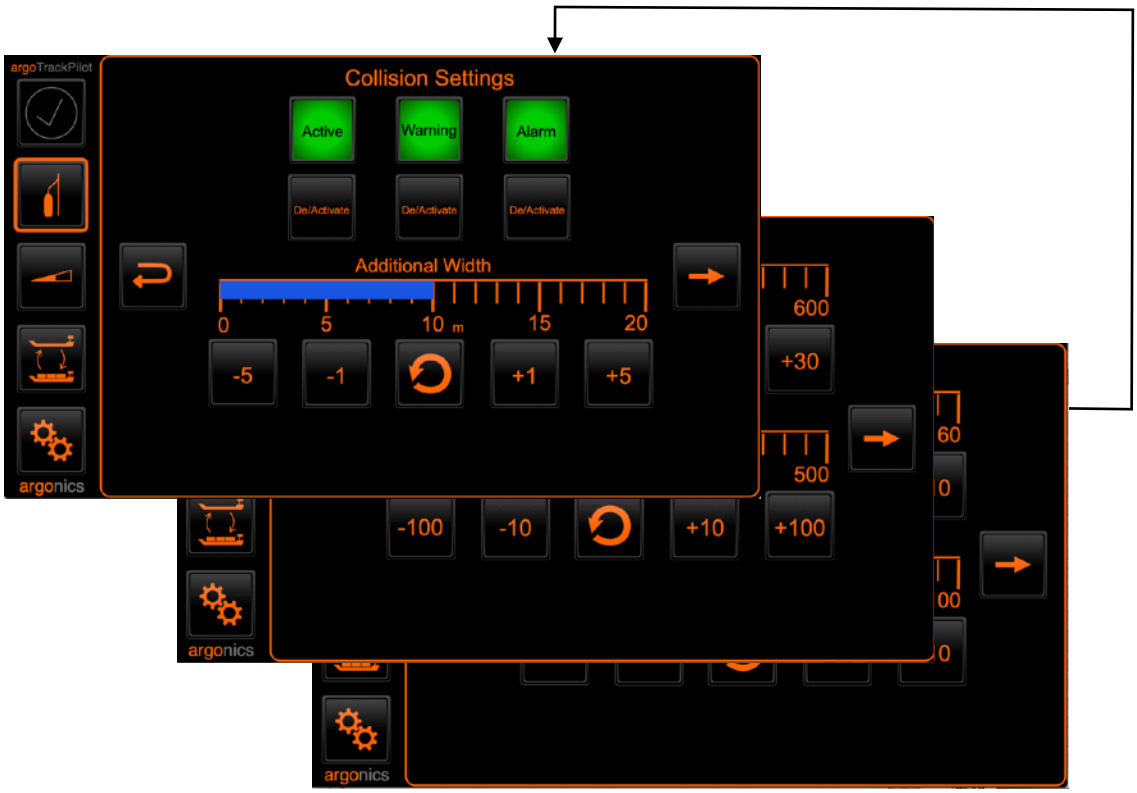


The list contains all important information about the detected potential collisions:

- Name of target, distance to target, velocity of target and time to collision.
- The configuration interface can be opened up using the gears button.
- To exit the page just press the button with the return arrow on the left.

Configuration of argoLaneWarning

The configuration interface is divided into 3 sub-pages which can be switched using the arrows on the right-hand side.



General settings can be found on page 1:

- Switching collision warning on and off:
  Activates or deactivates the entire collision warning module. If this setting is deactivated collisions are not detected. There are no visual indications in the user interface in the event of a potential collision.
- Switching the acoustic warning on and off: Deactivates the acoustic warning when a potential collision is detected. Visual indications and the alarm remain unaffected. Settings for the acoustic warning thresholds can be adjusted on the second page of the configuration interface.
- Switching the acoustic alarm on and off: Deactivates the acoustic alarm when a possible collision is detected. Visual indications and the warning remain unaffected. Settings for the acoustic alarm thresholds can be adjusted on the third page of the configuration interface.
  NOTE: A triggered alarm can only be confirmed by deactivating argoTrackPilot.
- Additional Width: Setting the extra lateral width of the safety corridor. For details please refer to the descriptions in the section „Collision Detection“.

On page 2 the settings for the acoustic warning can be modified. These settings also apply to the visual information on the main user interface of the TrackPilot:

- Threshold time to collision:
  A warning will be triggered if the time to collision is lower than this threshold. In order to be warned of fewer collisions this threshold value can be reduced. An increase in this threshold leads to more and earlier warnings.
- Threshold distance:
  A warning will be triggered if the distance to an AIS target is smaller than this threshold. In order to be warned of fewer collisions this threshold value can be reduced. An increase in this threshold

leads to more and earlier warnings.

On page 3 the settings for the acoustic alarm can be modified:

- Threshold time to collision:
  An alarm will be triggered if the time to collision is lower than this threshold. In order to be alarmed of fewer collisions this threshold value can be reduced. An increase in this threshold leads to more and earlier alarms.
- Threshold distance:
  An alarm will be triggered if the distance to an AIS target is smaller than this threshold. In order to be alarmed of fewer collisions this threshold value can be reduced. An increase in this threshold leads to more and earlier alarms.
  NOTE: A triggered alarm can only be confirmed by deactivating argoTrackPilot.

7.7. argoTracks - Guideline Service

The guideline service argoTracks can be subscribed to together with the maintenance contract. The lines are maintained by argonics customer support and are constantly being improved with every feedback from the various skippers. Thus don't hesitate to give argonics customer support feedback about a suboptimal course of a line.

The user interface on the touch display was already described in chapter 7.1 part „argoTracks“.

On the ECIDS-PC

Additionally there is an advanced user interface which can be reached with a PC, usually the ECDIS PC. The usage of this user interface is described in this chapter. To do this, please deactivate the firewall of the argoTrackPilot.

NOTE: Since the interface to any external PC is a possible security issue the user interface is only reachable when deactivating the firewall.

For an installation on your PC please contact argonics customer support.

Put in the pin code you already use to log in to the user interface on the touch display. You will reach the following page:

The current position is displayed on the map with an orange dot. The black line represents the currently active track. You can move the map and inspect this track here.

To update the tracks package use the button below „Download new Tracks“. argoTrackPilot will then look for a new package and if available install it automatically. After updating the package the page will reload.

Choosing a track on the ECDIS-PC

To choose a line simply click on the button below „Choose new track“.

The displayed line will switch to all available tracks, stored in the TrackPilot. Click on a line to choose it for activation.

If there is more than one track at the clicked location, only these tracks are then displayed on the map. Further a dropdown menu on the left side appears which can be used to choose one track from these tracks.

To reduce the number of selected tracks further click on any of the displayed tracks or choose a line from the dropdown on the left.

When the selection has finally been made to only one track its name is displayed on the top left.

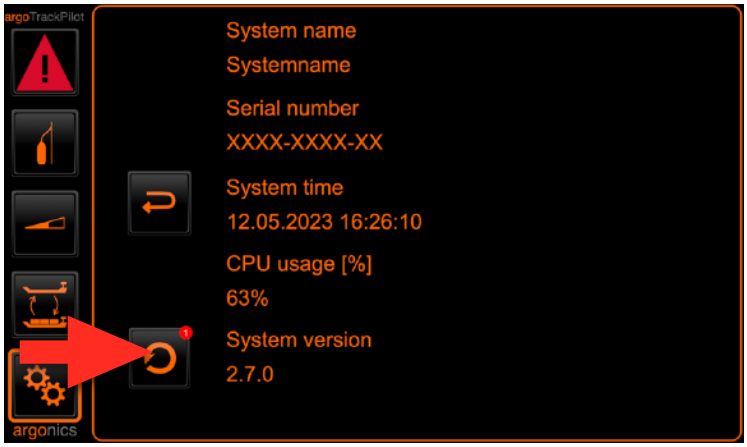
You can activate this track by clicking on „Activate“. After successfully loading the track the diplayed lines will disappear and the currently active track will be shown again. Please confirm the selection by checking if the line in your ECDIS and the track you selected match.

7.8. Updating the software

As of version 2.6., updating the software of the argoTrackPilot is possible via the touch display.

The TrackPilot regularly checks whether updates are available. If an update is available, this is indicated by a red "1".

To install the update, please open the settings (button 19, gear wheel) and click on the info icon (button 3 of the general settings).



The update button is located on the left edge of the display, right next to the currently installed software version. After pressing the button, follow the on-screen instructions to update the software. After the update is successfully installed, both the TrackPilot and the display will reboot.

8. Troubleshooting

8.1. Restarting the TrackPilot

If it is necessary to restart the TrackPilot open the fuse F4. The location of the fuse F4 can be seen in chapter 6 in the attached pictures of the control cabinet. Wait for 30 seconds and put the fuse back in. The TrackPilot will boot automatically.

8.2. Opening the Firewall

Customer service may have to provide remote maintenance in support cases. The firewall must be opened for this purpose.

The firewall is operated in the "General settings" menu via the two buttons "Open" and "Close".

Pressing "Open" deactivates the firewall and allows connections for remote maintenance etc.. To reactivate the firewall, the "Close" button must be pressed for a few seconds. A small bar above the button indicates the closing process.

Above the two buttons the state of the firewall is shown. The lock icon represents whether the firewall is open or closed.

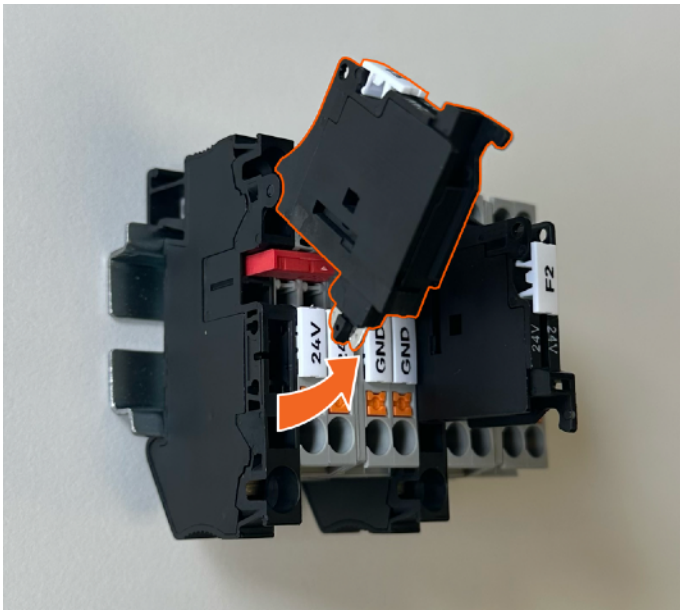
If the firewall is open, the remaining time is also displayed. After the time has expired, the firewall will be closed again automatically.

The firewall is automatically activated 5 minutes after restart.

8.3. Restarting the TrackPilot

If it becomes necessary to restart the TrackPilot because the software on the controller has a malfunction, fuse F1 must be opened.

After 30 seconds, the fuse can be closed again. The controller will then start up again by itself.



8.4. Warnings

With the help of warnings, the TrackPilot signals less critical conditions of the system which do not require immediate intervention by the skipper. However, the skipper should check the cause of the warning and, if necessary, switch to manual mode.

The following table lists all warnings and gives recommendations on what to do when the corresponding warning occurs.

Warning Name	Description	Action
Close to end of track	The ship is approaching the end of the track. After the end of the track, the system can not calculate meaningful control commands.	• Switch to manual steering • Choose new track
Position unusable	Error detection of GPS sensor found a problem.	Wait for the warning to disappear If EstimationDegraded error comes up switch to manual steering
Distance to track large	The cross track error to the parallel line is too large.	Check if the autopilot system processes the commands by the track control system (compare rate of turn to desired value) Acknowledge warning
GPS (2): No position received	GPS receiver does not send GGA sentences	Acknowledge warning Closely monitor track control system for correct operation Increase attention Wait if data comes back otherwise switch to manual steering
GPS (2): No velocity received	GPS receiver does not send VTG sentences	Acknowledge warning Closely monitor track control system for correct operation Increase attention Wait if data comes back otherwise switch to manual steering
GPS (2): No heading received	GPS receiver does not send HDT sentences	Acknowledge warning Closely monitor track control system for correct operation Increase attention Wait if data comes back otherwise switch to manual steering
Velocity low	The velocity of the ship is below a certain threshold. At slow speeds there is not enough rudder force to steer the ship.	Increase velocity or switch to manual steering
Deadman Warning	The deadman watchdog hasn't registered any input for the set time period.	Make any input on the TrackPilot like clicking any button on the touch display or press any button on the control panel.

Warning Name	Description	Action
Target too close	The distance to the AIS target is too small. The behavior of the TrackPilot can be strongly influenced by course fluctuations from the AIS target.	Reduce speed, deactivate TargetPilot or select another AIS target
Target lost	The AIS information about the selected target has not been updated for a few seconds. If the target does not send an update again within the next few seconds, an alarm is activated.	Pay close attention, especially in tight or twisted areas.
AIS: No data received	AIS data is no longer received.	If the TargetPilot is active, continue sailing with increased attention. If there is a malfunction of the AIS, deactivate the TargetPilot immediately. The warning will confirm itself if the data reception is coming back.
Collision ahead	A possible collision with an AIS target was detected	Move the current track to avoid the collision. Wait for the ship to reach the shifted line. The warning should then confirm itself.
Power supply connected incorrectly	The power supply has been connected incorrectly. (TrackPilot classic only)	Contact dealer/installer
TrackPilot switched off	The TrackPilot was unexpectedly switched off	Activate TrackPilot again if required Check correct function of all devices
End of SafetyContour ahead	The end of the safety corridor is approaching.	Select new safety corridor
PS/SB limit violated	The left/right boundary of the safety corridor is crossed with the proposed path.	Move the track to keep the planned path within the safety corridor
No ROT received	The turn rate reception is disturbed (only TrackPilot serial with Alphatron autopilot).	Check the correct function of all devices. If this warning does not disappear by itself, contact support.
ECDIS: Connection lost	The connection to the ECDIS has been interrupted	(Re-)Start the ECDIS If this warning does not disappear by itself, contact support.
Alphatron Display: Connection lost	The connection to the Alphatron control unit has been interrupted	(Re-)Start the Alphatron Display. If this warning does not disappear by itself, contact support.
AIS: Error - Contact support	The connection to the AIS has been interrupted or there is an error in the software	(Re-)Start the AIS. If the warning does not disappear by itself, contact support.

8.5. Alarms

Alarms are triggered in critical conditions of the system and require immediate intervention by the skipper. The following table lists all critical alarms and gives recommendations on what to do when the corresponding alarm occurs.

Alarm Name	Description	Action
DistanceError	The cross track error to the parallel line is too large.	Switch to manual steering Check if the correct track has been chosen Choose another line closer to the current position
End of track reached	The ship is very close to the end of the track. After reaching the end the track control system cannot continue steering.	Immediately switch to manual steering Choose new track
Turn too sharp	The currently chosen track contains an error like high curvature.	Switch to manual steering Check track for errors (points very close together) Choose new track
Rudder change too large	Fast change in rate of turn command to autopilot. The command has not been sent to the autopilot to prevent a dangerous maneuver caused by too large rudder change. Could be caused by an undetected error of the GPS sensor.	Acknowledge alarm by switching to manual steering. Wait until state of track control system returns to „READY“. Check in ECDIS if ship position on map and reality match. Switch on track control system Increase attention
Position unusable	Error detection of GPS sensor found a problem like a big change in position or heading angle, probably caused by crossing beneath a bridge.	Acknowledge alarm by switching to manual steering. There is no other way to acknowledge the alarm. Wait until state of track control system returns to „READY“. Check in ECDIS if ship position on map and reality match. Switch on track control system Increase attention
Dead man alarm	The deadman watchdog hasn't registered any input for the set period of time allthough there has already been a warning.	Switch the TrackPilot off to acknowledge the alarm. You can switch the TrackPilot on again.
Target too close	The distance to the selected AIS target is too short. The behavior of the TrackPilot is too strongly influenced by possible course fluctuations from the AIS target.	Acknowledge alarm by switching to manual steering. There is no other way to acknowledge the alarm. Steer manually. Deactivate argoTargetPilot, increase the distance to the selected AIS target or select another AIS target.

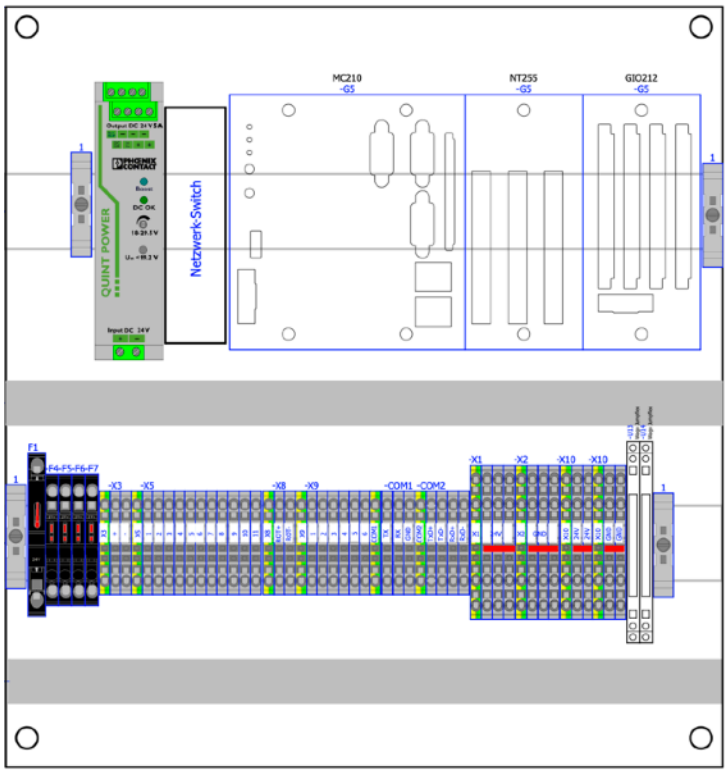
Alarm Name	Description	Action
Target lost	The information about the selected target has not been updated for too long.	Acknowledge alarm by switching to manual steering. There is no other way to acknowledge the alarm. Steer manually. Deactivate argoTargetPilot or select another AIS target.
Collision ahead	An imminent collision was detected.	Acknowledge alarm by switching to manual steering. There is no other way to acknowledge the alarm. Steer manually to avoid any collision. If the alarm is incorrect, check the argoLaneWarning settings.
Autopilot connection lost	The connection to the autopilot was interrupted (TrackPilot serial only).	Switch off immediately. Check correct function of all devices. Contact customer service.
I/O: Error - Contact support	There is an error in the input/output module of the TrackPilot (TrackPilot classic only).	Switch off immediately. Check correct function of all devices. Contact customer service.

9. argoTrackPilot – Overview

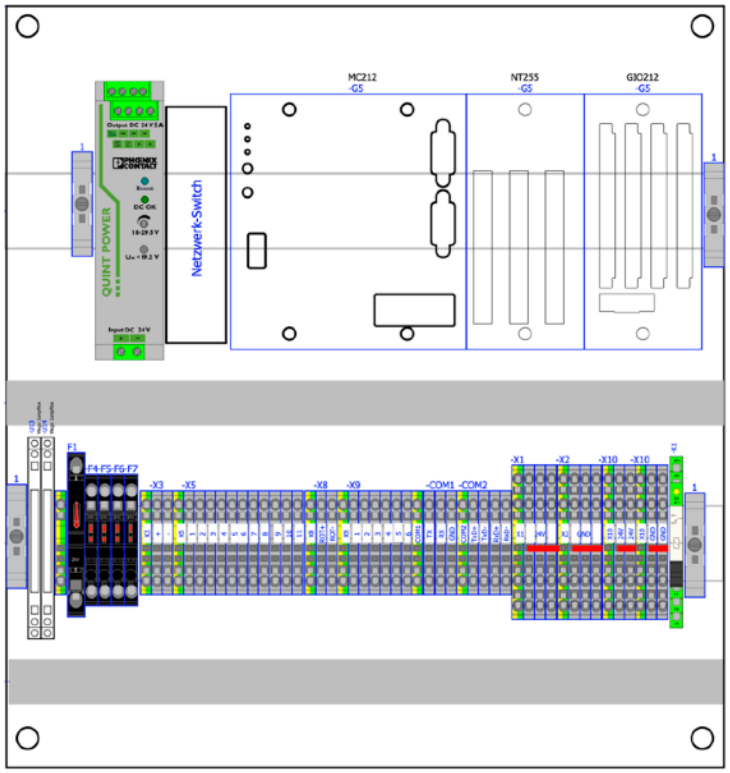
9.1. argoTrackPilot classic

The following graphics shows the layout of the control cabinet. The hardware version can be seen on the label located on the plc. The last three characters of the field „Typ“ show the hardware version of the installation.

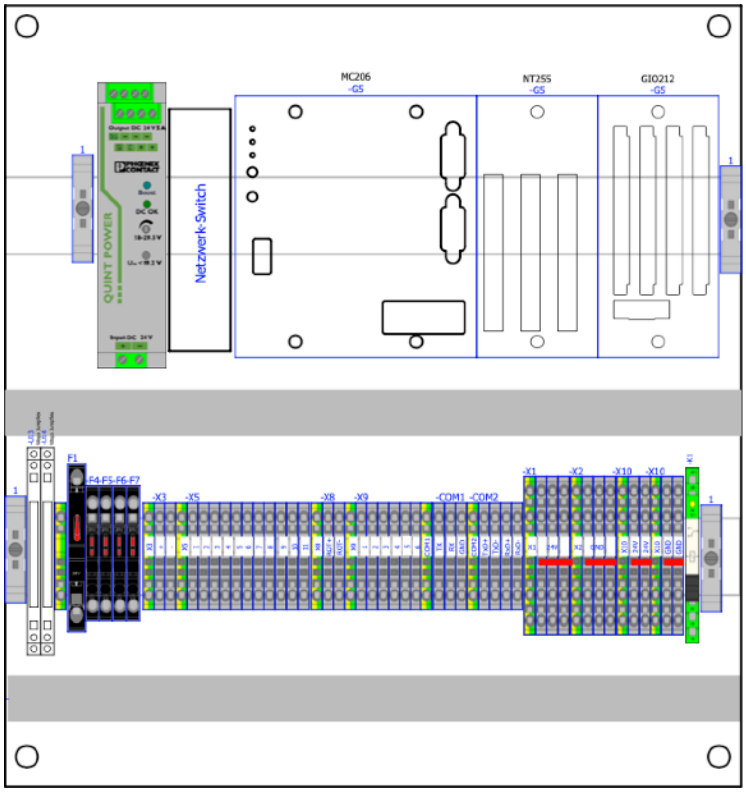
Hardware Version 2:



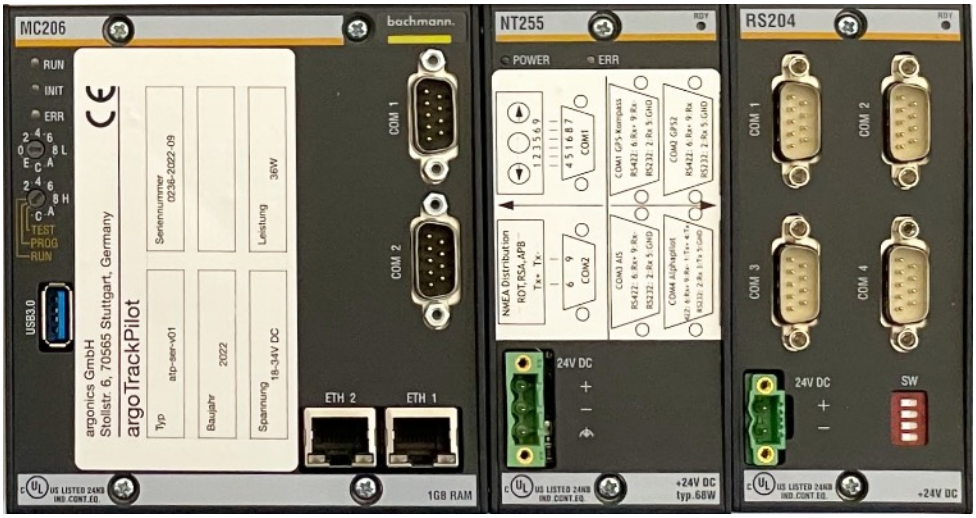
Hardware Version 3:



Hardware Version 4:



9.2. argoTrackPilot serial



10. Notes

Serial number of the TrackPilot:

PIN for the TrackPilot:

Technician:

Date of installation:

Miscellaneous