ErControl Documentation

Document version 18

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Oct 25, 2026

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Welcome to the ErControl documentation.

1 Installation

This chapter describes how to install ErControl.

1.1 Requirements

- Windows 10 or 11
- An ergometer with a *serial interface*/USB port, *BLE FTMS* support (or *Tacx FE-C over Bluetooth*), or *ANT+ FE-C* support
- For ANT+ (trainer or heart rate monitor), additionally: an ANT+ USB stick with its driver (from the stick's manufacturer, not part of the ErControl installation)

The ANT+ USB stick

The ANT+ stick is a small USB plug with the ANT+ logo (here an ANTUSB-m from Dynastream). The model name and approval marks are printed on the back.



Fig. 1: Front with USB plug and ANT+ logo



Fig. 2: Back with model name (M/N: ANTUSB-m)

1.2 Installing via the setup

1. Download the current setup from the ErControl homepage.
2. Run the installer and follow the wizard.
3. Start ErControl via the newly created Start menu icon.

At the end of the setup, ErControl can be started directly. The setup exits immediately, and ErControl runs with the rights of the user who started the setup, not with administrator rights. With a silent installation, ErControl is not started.

The setup installs `AntInterface.exe` automatically (its own `AntInterface` subdirectory) - for ANT+ (trainer or heart rate monitor), no separate installation step is needed afterwards, see *Requirement for ANT+*.

1.3 First start: database and first user



Fig. 3: Start window: login, database and appearance. “Verbunden.” (connected) appears at the bottom once the database is open.

At the first start, you choose or create a database file in the start window. For a **new** database, the dialog **Create first user** then appears with the same fields as in *user management* (user ID, first name, last name, date of birth, sex, weight, resting heart rate, maximum heart rate, and starting power); if the maximum heart rate is missing, ErControl suggests a value there just as it does there, and the *heart rate zones* are already shown as a preview while you type. **Create** only becomes active once a user ID has been entered; **Cancel** (also via X or Alt+F4) discards the database that was just created, still empty, and restores the previous database. There is no automatically created administrator account anymore - the first user is always deliberately created via this dialog.

If a chosen database needs its data format updated (for example after an ErControl update), the migration runs automatically in the background; the start window shows “Migration running” meanwhile and is locked until it finishes. The original database file remains unchanged; ErControl then works with a newly created, migrated file. The name of the migrated file consists of the previous

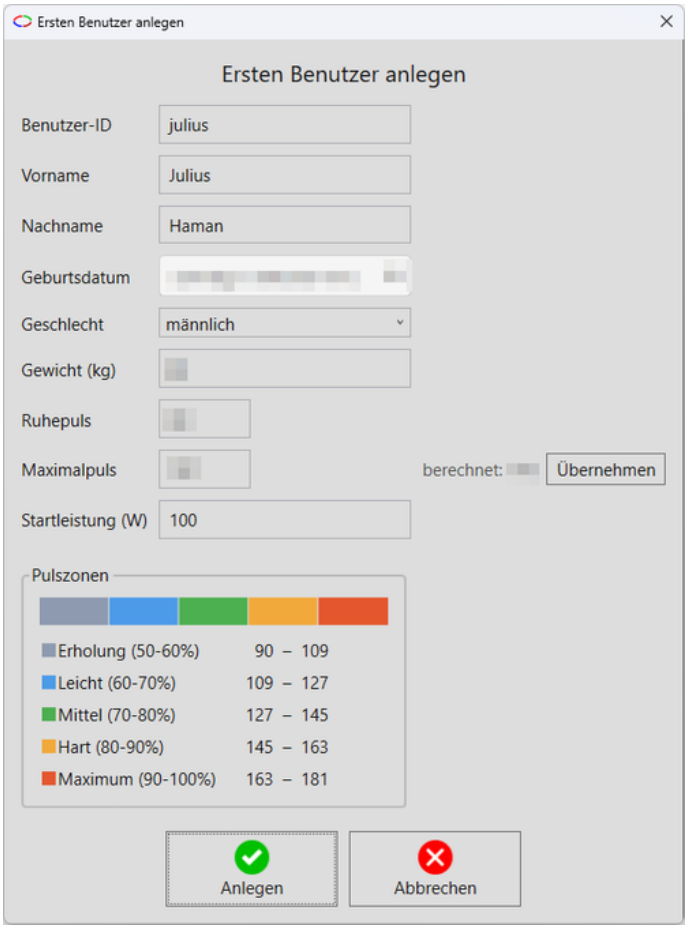


Fig. 4: The **Create first user** dialog with the heart rate zone preview.

name without version information and the new database version, for example `ErControl.3.1.5.0.db`; an existing version suffix is replaced, even if the file was renamed by hand with an underscore before the version (`ErControl_3.1.4.0.db` becomes `ErControl.3.1.5.0.db`). If the target name already exists, ErControl appends a running number. If a migration fails, instead of "Connected" a short note pointing to the log appears, along with the **Retry migration** button.

1.4 The Start Window

The start window appears every time the program starts and combines three areas:

- **Login**: Here you choose the **user** from the list of users in the open database and log in. With **Login automatically** the click is no longer needed at the next start, see *Settings*.
- **Database**: Shows the file path and version of the database. **Choose Database…** opens an existing database file, **New Database…** creates a new one (followed by the dialog for creating the first user). Below it is the status: **Connected.**, a note that the file was not found, or **Migration in progress**.
- **Appearance**: Here you set the look and the language of the user interface.

Setting	Choices	Effect
Skin	Light, Dark	Switches immediately between the light and dark appearance and remembers the choice for this Windows user account.
Language	System, Deutsch, English	Takes effect from the **next program start**. With **System**, ErControl follows the Windows language.

You can also switch the login later from the running application: **Sign in again** in the navigation bar reopens the start window, for example for a different user or database. The **Login automatically** option does not apply then, so that the selection actually appears.

1.5 Backing Up the Database and Moving It to Another PC

All trainings, profiles, users and the per-user settings (tabs **Training** and **Ergometer**) are stored in a single database file with the extension `.db`. By default ErControl places it here:

```
%LocalAppData%\ErControl3\databases
```

The actual path is shown in the start window and on the start page in the **Overview** area. You can also create the file in any other location.

Backing up

1. Close ErControl so that the file is not in use.
2. Copy the `.db` file to a safe place, for example an external drive or a cloud folder.

Moving to another PC or restoring

1. Install ErControl on the target PC (see above) and start it.
2. Copy the saved `.db` file to any location on the target PC, for example to the default folder mentioned above.

3. In the start window choose **Choose Database…** and open the file.

If the file comes from an older ErControl version, ErControl migrates it automatically (see *First start*); the copied original file remains unchanged.

> **Note**
>
> **Not in the database** are the settings that apply per Windows user account: the most recently opened database, skin, language, size of the value bar and log level. They are stored in the Windows registry and have to be set once on a new PC. The log files are located in `%LocalAppData%\ErControl3\logs`.

2 Program Documentation

2.1 Main Window

The main window of ErControl consists of the **navigation bar** on the left and the content area on the right, which shows the selected page (training overview, profiles, users, devices, settings and so on). The training windows open separately, see *Training window*. Use **Sign in again** in the navigation bar to switch the user or the database, see *The Start Window*.

Home page

The start page greets the logged-in user and, in the **Overview** area, shows the open database (with its directory), the total number of trainings and the number in the current week, and the date and time of the last training. At the top right are the links **Forum**, **Send feedback** and **About ErControl...**. **Forum** opens the ErControl forum (forum.ercontrol.de) in the browser, **Send feedback** opens a new e-mail to the developer in your mail program (the subject "ErControl Feedback" is already filled in). **About ErControl...** shows information about the installed version and the map data used; the dialog also contains links to the homepage, the forum, feedback and **Support via PayPal**, each with a small icon. The exact address appears as a tooltip when you hover over a link.

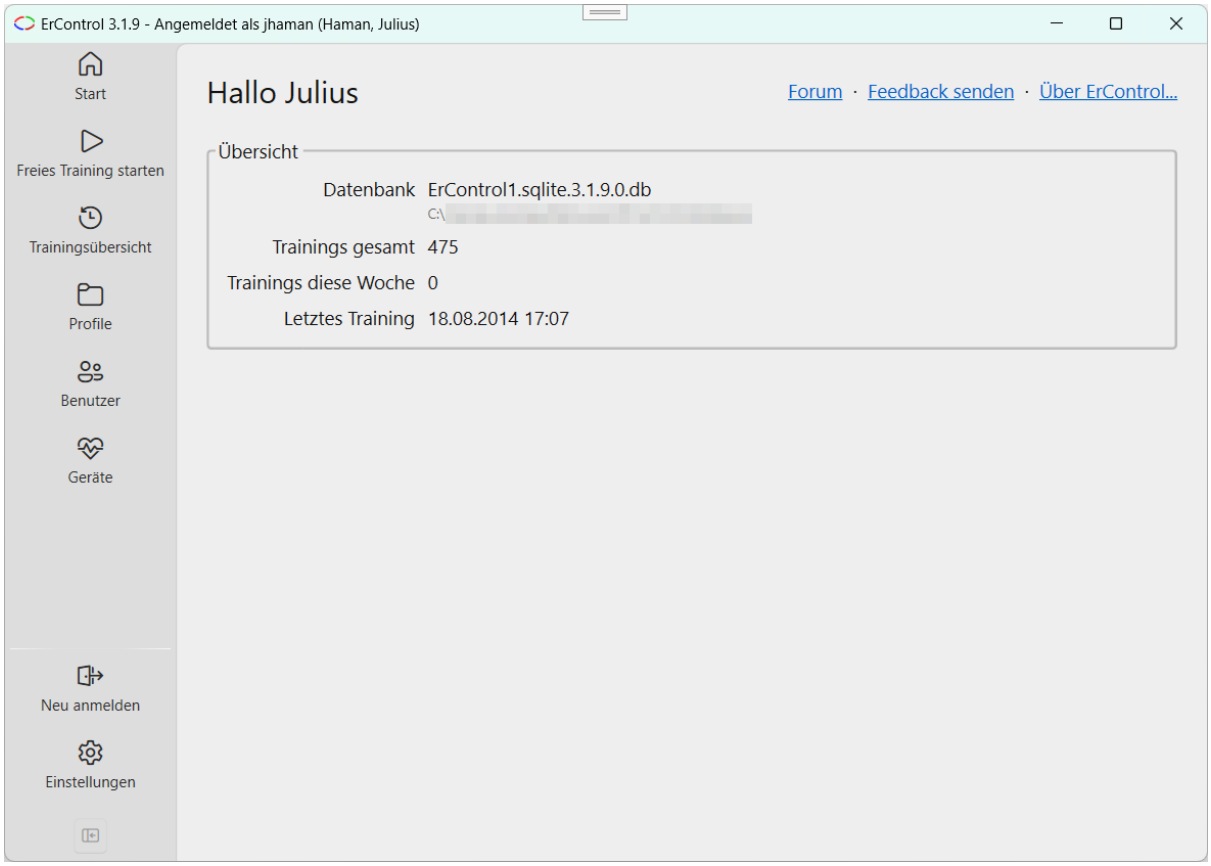


Fig. 5: Main window with the navigation bar on the left and the start page.

Notice about a new version

If a newer ErControl version exists, an orange highlighted notice appears at the top of the home page with the number of the new version and a **Go to download page** link, which opens the download page on ercontrol.de in the browser. ErControl checks this once per program start in the background; if the computer is offline or the page cannot be reached, no notice appears and nothing delays the start. The check can be switched off in the *Settings* (**Check for a new version at program start**, applies per user).

Hiding the Navigation Bar

So that pages with a lot of content - such as the *Training Detail* with charts and map - get more room, the navigation bar can be hidden:

- A small, semi-transparent button at the very bottom of the bar hides it; it becomes more visible when you hover over it. You get the same with **Ctrl + B**. The content then uses the full width.
- If you move the mouse to the **left edge** of the main window, the bar reappears - as an overlay above the content, without shifting or shrinking it. It disappears again shortly after the mouse leaves it or after a click on a menu item.
- As long as the bar is shown this way, the button is called **Pin**. A click on it (or **Ctrl + B**) restores the fixed navigation bar.

ErControl remembers the state and restores it at the next start; by default the bar is visible.

2.2 Starting Free Training

Here's how to start a free training session in ErControl:

1. Set up a training device in the **Devices** area and mark it active - *serial*, *ANT+ FE-C*, or Bluetooth (*BLE FTMS* or *Tacx FE-C over Bluetooth*). Optionally also mark a heart rate monitor active.
2. In the main window, choose **Start Free Training**. ErControl then automatically tries to connect to the active training device (and any active heart rate monitor) using the configured connection type.
3. If no connection can be established, the connection dialog offers to continue with simulated data instead, or to cancel entirely.

During training, gear shifter, intensity and camera distance can be controlled via the keyboard, see *Keyboard shortcuts during training*. The gear icon at the top right lets you change the gear shifter and other settings directly during a running training, and the size of the value bar can be adjusted live - see *Training window*.

2.3 Training Overview

The training overview shows all past training sessions of the currently logged-in user and is opened via the entry of the same name in the navigation bar of the main window. A double-click on a training opens the *Training Detail* with tiles, heart rate zones, map and charts; from there you can page through the trainings. When you return from the detail page, also after paging or via the navigation bar, the training viewed last is highlighted and has the keyboard focus.

Layout

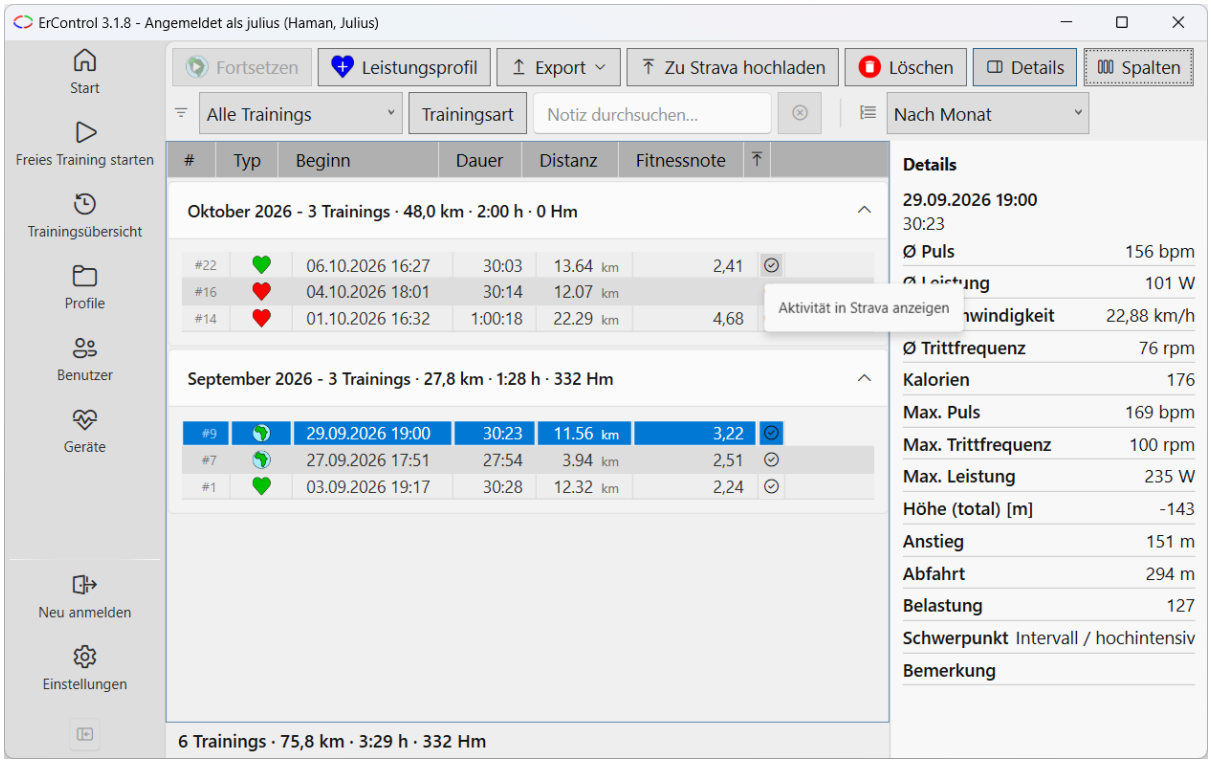


Fig. 6: Training overview: toolbar and filter bar at the top, table grouped by month with total rows and Strava check marks, detail area on the right.

- Above the table, a toolbar with the *actions* and the **Details** and **Columns** buttons.
- Below it, a filter bar, see *Filtering and grouping*.
- Below it, on the left, a table listing the training sessions (newest first). On the far left is the fixed **ID** column (header **#**): the internal number of the training with a leading #, for example **#501**, discreetly in small type. It stays in place when scrolling sideways and can be neither moved nor hidden. Behind it follow the fixed columns **Type**, **Start** and **Duration**. Several rows can be selected at once with Ctrl- or Shift-click, see *Multiple selection*.
- Next to it on the right, an optional detail panel with the values that are not currently shown as a table column (can be toggled with the **Details** button, available only while exactly one training is selected).

The **Columns** button lets you choose which further metrics are shown as table columns, including average and maximum values for heart rate, power, and cadence, distance, calories (in kcal), fitness score, **Load** and **Focus** (see *Load and focus*, hidden by default), and, for topographic profiles, ascent, descent, and total elevation. A leading Ø, Min. or Max. in the column header marks average, minimum and maximum values; the unit (km, km/h, W, m, bpm, rpm) is shown small after the number. The duration is shown as m:ss (h:mm:ss from one hour on), and its column is right-aligned. The **Note** is also a selectable column: ticked (default), it appears on one line in the table and long texts are shortened with "…"; unticked, it appears as the last entry in the detail panel on the right, there with the full text and line breaks. The note is edited on the *training detail page*. Column order and visibility are stored per user; the ID column is excepted.

Filtering and grouping

With many training sessions the list can be narrowed down and structured. The filter bar sits above the table:

- **Period**: **All trainings**, **This week** (from Monday), **This month**, **Last 30 days**, **This year** or **Custom** with the fields **From** and **To** (short date format, both limits inclusive).
- **Training type**: multiple selection from Free training, Heart rate, Power and Topographic profile.
- **Search field** "Search notes…": filters by the text of the note, ignoring upper and lower case.
- **Reset filters** sets all filters back to "All".
- **Group by**: **No grouping**, **By month** or **By training type**. The groups can be collapsed, the group header shows the totals of the group. Sorting by column header applies within the groups; the groups themselves are sorted by month descending or by training type ascending.

Below the table is a summary row for the displayed trainings (count, distance, time, elevation gain); with an active filter additionally "x of y trainings". **Export (CSV) all** exports the filtered trainings.

Period (including **From**/**To**), training type and grouping are saved and restored at the next start; the search text is not. If you return from the detail page to a training that the filter would hide, the filter is reset so that the training can be selected.

Multiple selection

Several trainings can be selected at once (Ctrl- or Shift-click). **Export** and **Delete** then act on all selected trainings, see *Export*. **Continue**, **Power profile** and **Details**, on the other hand, are only available while exactly one training is selected - with none or more than one selected, they are disabled.

Actions

The following actions are available for the trainings selected in the table:

- **Continue** – only while exactly one training is selected: continues it (free training, heart-rate and power profiles). For a topographic training, the button is active as long as at least 100 m of the profile remain: it then opens the *start window* with the end position as the pre-filled start distance, see *Continue Profile*. At the end of the profile it is disabled. A different starting point can be chosen in the *Profiles* view via the start distance in the start window.
- **Power profile** – only while exactly one training is selected: creates a new power profile from its data.
- **Export** – see *Export* below.
- **Upload to Strava** – uploads the selected trainings to Strava, see *Strava*. Only visible if Strava is switched on in the *settings*.
- **Delete** – permanently deletes the selected trainings after confirmation.

Export

The **Export** button opens a menu with **Export (TCX)**, **Export (FIT)**, **Export (HRM)**, **Export (CSV)** and, separated below, **Export (CSV) all** (always all displayed trainings, regardless of the selection). TCX, FIT, HRM and CSV export the selected trainings in the respective format: with exactly one training selected via a file dialog, with several via a folder (the title names the count); a file

`Training<date>_<time>.<extension>` is created for each training, with ' (2)' appended on a name conflict. The TCX file contains the sport Biking, the average and maximum heart rate of the training, and, in the activity notes, first the note of the training (if there is one) and below it the maximum and resting heart rate saved at the time of the training; Garmin Connect and Strava show the average and maximum heart rate directly. The FIT file contains power, heart rate, cadence, speed, distance and elevation for every second (for topographic trainings also the position) as well as summaries for lap, session and activity; the TCX file contains the speed per trackpoint.

Every export contains only one training point per second, in chronological order, so that Garmin Connect and Strava accept the files; this also applies to older trainings that contain duplicate timestamps. Because ErControl stores the measuring points to the millisecond, FIT, HRM and CSV convert them to a grid of one point per second (distance, elevation and speed are interpolated in the process); TCX keeps the exact timestamps. In addition, the TCX file contains a position (latitude/longitude) only for topographic trainings; for all others it is omitted.

Exporting or deleting several trainings locks the main window meanwhile; if it takes longer than 2 seconds, a progress dialog with **Cancel** appears, which keeps the trainings already processed.

Strava

If Strava is switched on in the *settings* and connected to your account, trainings can be transferred to Strava directly:

- **Upload to Strava** uploads all selected trainings one after another (oldest first). A progress dialog shows "Training x of y" and offers **Cancel**; trainings already uploaded are kept. At the end ErControl reports how many trainings were uploaded, and in case of an error the reason (for example connection rejected, Strava unreachable or request limit reached).
- If a selected training has already been uploaded, ErControl asks before uploading whether to upload it again; with **No** only the remaining trainings are transferred. Strava detects duplicates itself; an existing training is then linked to the existing activity.
- The column with the upload icon after the training type shows a check mark for uploaded trainings. Clicking it opens the activity on Strava; the table's context menu offers the same (right-click, **Show activity in Strava**, only active for an uploaded training). A right-click first selects the row under the mouse pointer.
- If you do not want to upload every time, switch on the automatic upload after training in the settings.

2.4 Training Detail

The training detail page shows a single training at a glance: metrics as tiles, the heart rate zones, the route ridden on the map and charts. It opens with a **double-click** on a training in the *Training Overview*. The **Back** button at the top left returns to the overview; the training viewed last is then highlighted there, and the table scrolls to it. This also applies if you leave the detail page via the navigation bar and open the training overview again. The highlighted row then has the keyboard focus, so the arrow keys continue from it.

Paging

With the two arrow buttons directly to the right of **Back** (tooltips **Previous training** and **Next training**) you page through the trainings, in the same order as in the overview (newest first). If you then go back to the overview, the training viewed last is highlighted, not the one with which you opened the detail page.

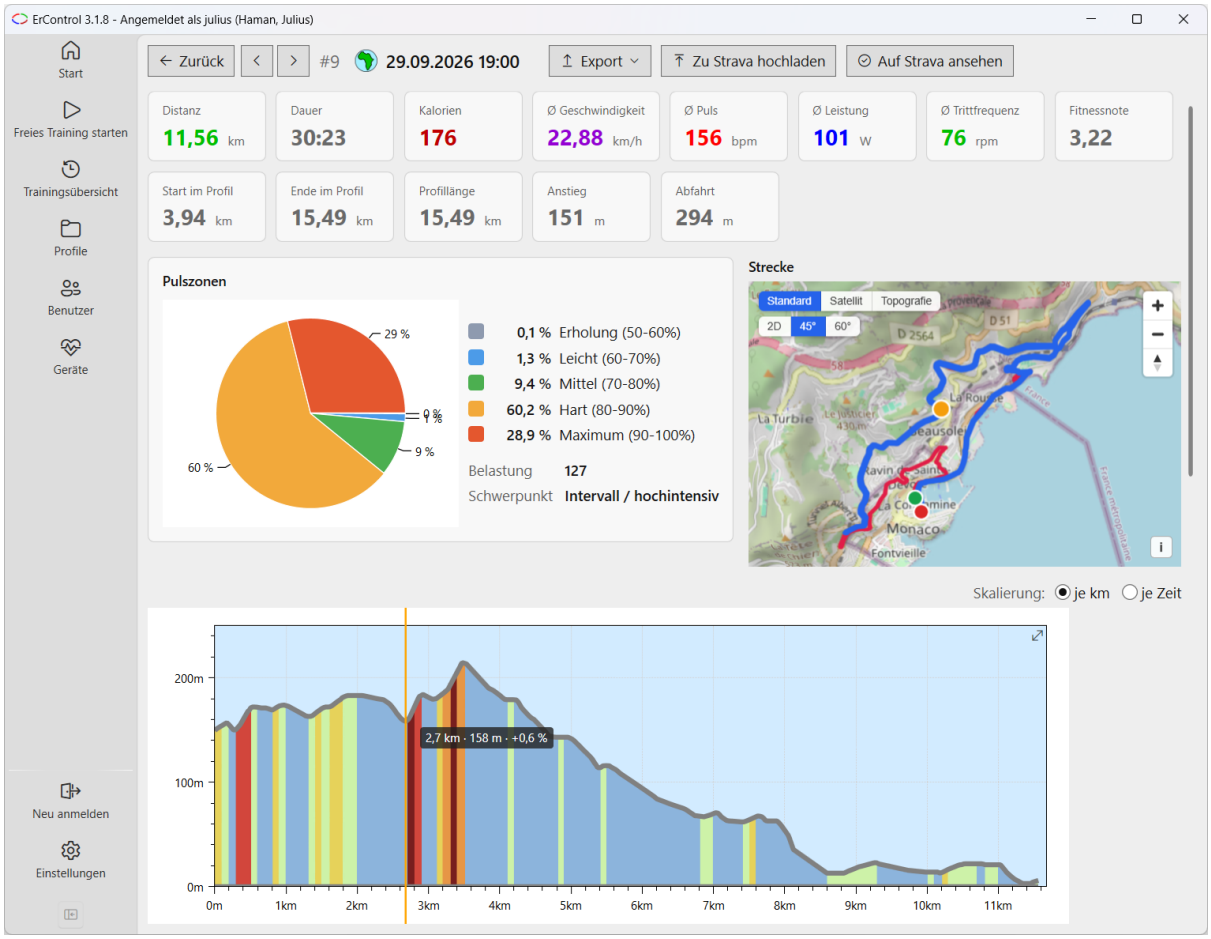


Fig. 7: Training detail of a topographic training: buttons at the top (including Strava), tiles, heart rate zones with load and focus, map and terrain profile.

For a topographic training whose profile has not been ridden to the end, the button **Continue profile at x km** sits next to them, see *Continue Profile*.

ID

Directly behind the paging buttons is the ID of the training: its internal number with a leading #, for example **#501**. It is assigned automatically and stays the same for the training permanently. The same number is the first, fixed column in the *Training Overview* - handy for referring to a training unambiguously, for instance when asking questions.

Export

The **Export** button exports the displayed training - via the same menu (**Export (TCX)**, **Export (FIT)**, **Export (HRM)**, **Export (CSV)**) as in the *training overview*.

Strava

With Strava switched on (see *Settings*), two more buttons appear next to **Export**: **Upload to Strava** transfers the displayed training (again after a confirmation if it has already been uploaded), and **View on Strava** opens its activity on Strava. The latter only appears for an uploaded training; its tooltip gives the time of the upload. The procedure and messages are the same as for the upload from the *training overview*.

Tiles

The tiles show the metrics of the training, in this fixed order: distance, duration, calories, Ø speed, Ø heart rate, Ø power, Ø cadence and fitness score. The unit (km, km/h, W, bpm and so on; mi and mph with imperial units, see *Units*) is shown small after the number; a leading Ø stands for the average. As in the value bar, the duration appears as m:ss, and from one hour on as h:mm:ss; heart rate and cadence carry the units bpm and rpm.

For topographic trainings, a second row with the profile-related tiles follows below:

- **Start in profile** and **End in profile**: the positions on the profile at which the training began and ended,
- **Profile length**: the total length of the profile ridden,
- **Ascent** and **Descent**: the elevation gained and lost.

The numbers are colored as in the value bar of a running training (*Training window*): distance and cadence green, heart rate red, power blue, calories dark red, everything else gray.

> **Note**
>
> The distance of a training always counts from 0, even if a topographic training began at a later kilometer of the profile. Where in the profile the training began and ended is shown by the two tiles **Start in profile** and **End in profile**. For topographic trainings recorded before the start distance was introduced and comprising more than one ride, the start position cannot always be reconstructed - there, the start in profile is shown as 0 km.

Heart rate zones

The pie chart shows what share of the training time you spent in each of the five *heart rate zones*. The segments have the colors of the zones:

Color	Zone
	Recovery
	Light
	Medium
	Hard
	Maximum

In the legend next to the chart, the percentage is shown before each zone name; zones with 0 % appear only there, not in the circle. A click on a segment shows the zone, seconds and share. The basis are the zone limits that applied at the time of the training (the maximum heart rate saved with the training), not your current maximum heart rate.

Load and focus

Below the legend are two further values, calculated from the distribution of heart rate zones:

- **Load**: the training stimulus as Edwards TRIMP - for each heart rate zone, the minutes spent in that zone times its zone number (1-5), summed up. Time below zone 1 (under 50 % of maximum heart rate) counts as 0.
- **Focus**: one of five categories - **Recovery**, **Base endurance**, **Threshold / tempo**, **Intervals / high intensity** or **Mixed** - determined by rules from the time shares of the heart rate zones alone, independent of the load. Trainings under 10 minutes of heart-rate data get no focus (the distribution would be too random); the load is still calculated.

Points without a heart rate reading count as zone Recovery here. Both values are calculated when the training is saved and stored with it, so they can appear in the *Training Overview* as selectable columns without having to load all measurement points there for every training (see **Columns** there). Existing trainings receive the values once, the next time the program starts after the update; if no maximum heart rate was known yet at that point, ErControl calculates them retroactively as soon as one is entered in the user profile for the first time.

Route

For topographic trainings, the map to the right of the pie chart shows the route. The section actually ridden is highlighted, the rest of the profile is shown subtly. The map can be operated like the other map views (*Map view*); here, however, the mouse wheel scrolls the page and does not zoom the map.

Charts

Below the tiles, a separate chart for each measured value shows the course of the training, as on Garmin and Strava: **heart rate**, **power**, **cadence** and **speed**, one below the other in this order. Each has its own axis on the left with the unit. A chart without measured values - for example heart rate without a chest strap or cadence without a sensor - is hidden.

- **Free training and heart-rate and power profiles**: the four measured-value charts over time. The heart rate chart has the *heart rate zones* as lightly tinted background bands (limits from the training's stored maximum heart rate) and, for heart rate profiles, the target curve.



Fig. 8: The measurement charts for heart rate, power, cadence and speed with guide line and tooltips; the averages on the right.

- **Topographic trainings**: additionally at the very top the terrain profile of the route actually ridden, colored by gradient as in the profile (*Gradient colors in the elevation profile*), below it the four measured-value charts. The terrain profile has no heart rate zone bands because its value axis is the elevation.

As in the profile view, all charts can be zoomed with the mouse wheel and panned with the right mouse button held down (*Operating the chart*). The X axes of the charts are coupled: zooming, panning and resetting affect all charts together.

Average

In every measured-value chart, a dashed horizontal line shows the average of the measured value over the whole training. The value is shown to the right of the chart, for example **Ø pulse** with **138 bpm**; it matches the tile of the same name. The terrain profile has no average line.

Maximizing a chart

The button with the arrow at the top right of a chart opens it maximized in a window of its own. There, the mouse wheel zooms (unlike on the detail page, where it scrolls the page), the orange guide line with its tooltip works as on the detail page, and the average is again shown to the right of the chart. The X axis has the same scale as the detail page. **Esc** or the window's close button takes you back to the detail page; the window is modal, so the detail page cannot be used while it is open.

Heart rate axis

The axis of the heart rate chart runs from the lower limit of zone 1 (50 % maximum heart rate) to the upper limit of zone 5 (100 %), so the five zones fill the height of the chart. If a recorded heart rate is above the maximum heart rate or below zone 1, it is still displayed - the axis then widens accordingly. Without a known maximum heart rate, the axis scales automatically to the available values. The heart rate zone bands and, for heart rate profiles, the target heart rate curve also lie on this axis. The other charts each have only their own axis (W, rpm, km/h or, for the terrain profile, the elevation).

Scaling the X axis

For topographic trainings, all charts share the same X axis, which lines up exactly from one chart to the next. With **Scale** you can switch the axis between **per km** (default) and **per time**. The choice is remembered. The gradient coloring of the terrain profile works in both scales. All other training types show the charts over time.

Aiming and Tooltips

When you move the mouse over a chart, an **orange guide line** follows it. The associated tooltip shows time and distance of the nearest recorded point as well as the measured value of this chart, for example **Power (W): 180** or **Cadence (rpm): 85**. The terrain profile shows the same tooltip as the profile overview: distance, elevation and gradient; with the scale **per time**, the training time is shown in front.

The lines run in sync in all charts: if you move the mouse in one chart, the line with its tooltip also appears in the others, and for topographic trainings a marker additionally moves along on the map so that you can see where on the route the value was recorded.

The time in the tooltips is shown compactly as m:ss (h:mm:ss from one hour on). The click tooltips of the live charts in the training window and the profile overview also show the time this way.

Note

At the very bottom of the page is the multi-line field **Note**, in which you can keep a note of your own for each training, for example about weather, how you felt or special events. The input is saved automatically: shortly after the last keystroke and immediately when you leave the page via **Back**, the paging buttons or **Continue profile**. There is no save button. If you empty the field, the note is removed.

The note also appears in the *Training Overview* (as a selectable column, see **Columns** there) and is carried over into the TCX export. Notes from ErControl 2 are taken over by the database migration.

Continue Profile

A topographic training whose profile has not yet been ridden to the end can be continued at its end position: next to the paging buttons, the detail page shows **Continue profile at x km**, and in the *Training Overview* **Continue** is active for this training. Both first open the *start window* with the end position of the training as the pre-filled start distance, which can still be changed there; **Start** then opens a **new** topographic training in the 3D training window (*Training window*) from that distance, **Cancel** closes the window without starting a training. So it does not continue the same training, but creates another entry in the overview once actually started. The button and Continue are only available as long as at least 100 m of the profile remain. Anyone who has ridden the profile to within a few metres of the end (for example, ending at 15.50 km on a profile length of 15.51 km) can no longer continue there.

2.5 Profiles

Under **Profiles** you manage training profiles: topographic profiles (route), heart-rate profiles, and power profiles. The page is opened via the **Profiles** entry in the navigation bar of the main window, right below *Training Overview*.

Layout

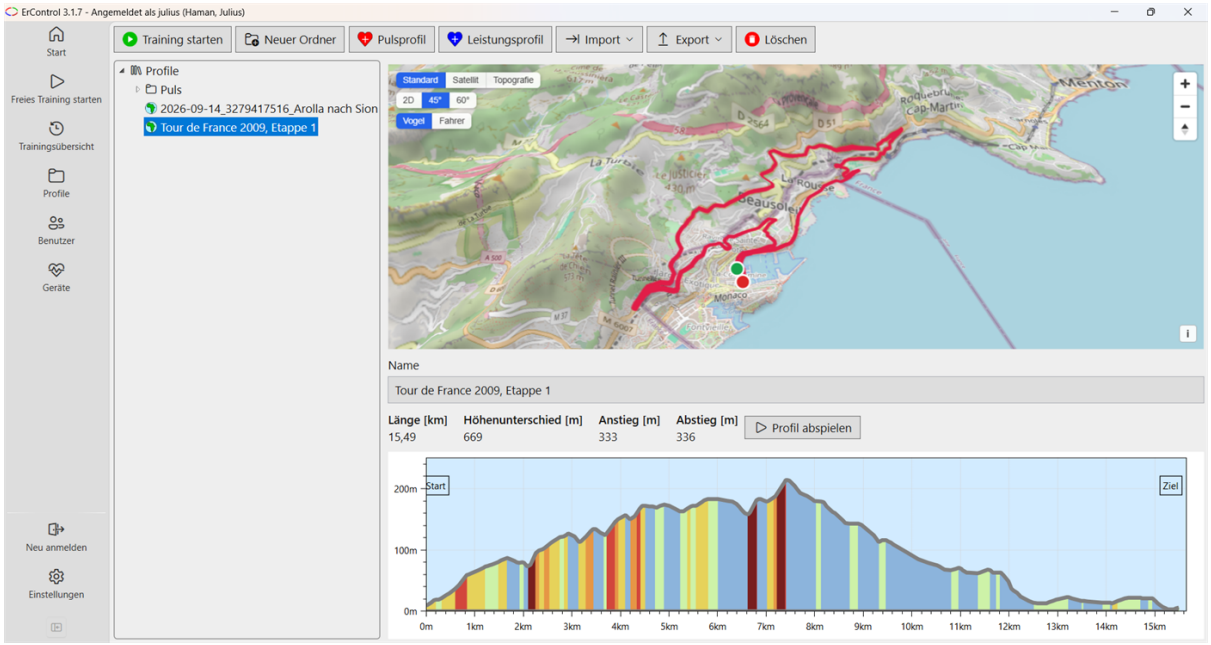


Fig. 9: Profiles: tree structure on the left, map, key figures and elevation profile of a topographic profile on the right.

- On the left, a tree of folders and profiles. The top-level entry **Profiles** represents the top level without a folder.
- On the right, for the selected profile, a name field plus metrics matching the profile type:
  - **Topographic**: length, elevation difference, ascent, descent.
  - **Heart-rate controlled**: duration (as m:ss, h:mm:ss from one hour on) plus target heart rate (min./max./average) in percent and beats.
  - **Power controlled**: duration plus target power (min./max./average) in watts or in % FTP, see *Power in watts or % FTP*.
- For topographic profiles, a 3D map of the route above the chart, see *Map and route preview (topographic profiles)*.
- A chart shows the profile's curve (route profile, or heart-rate/power curve). For topographic profiles, the elevation profile is additionally colored by gradient (fixed color bands like Strava/Garmin/komoot, see *Gradient colors in the elevation profile*). The elevation axis adapts to the actual elevation range of the route (with round axis limits and a minimum span of 50 m), so that flat routes remain readable and profiles at high altitude do not start at 0 m.
- For heart-rate profiles, the five *heart rate zones* are shown as lightly tinted bands (50/60/70/80/90/100 % of the maximum heart rate) behind the target curve; the curve is therefore drawn without an area underneath, and the heart rate axis always extends from 0 to at least 100 % of the maximum heart rate so that all zones are fully visible (it grows if a point lies above that). For power profiles, the power axis likewise always extends from 0 to at least 200 W.
- For heart-rate and power profiles, additionally a points editor (a table with time and target-value columns) used to edit the curve manually. Topographic profiles have no points editor; they are created exclusively via GPX import (see *Import and export*).
- For heart-rate profiles, the segments should be at least about 5 minutes long: heart rate follows a power change only with a delay (about 1-2 minutes) and then needs a while longer to settle. With shorter heart-rate changes the target heart rate is hardly reached, because the next change follows already. This is not a control fault, it is physiology.

The following applies to the points editor:

- **New row**: sits 5 minutes after the previous row and takes over its value (watts or % of maximum heart rate); the first row of a new profile starts with 25 W or 70 %. Only visible rows count as the previous row.
- **Tab** in the last cell of the last row inserts a new row and jumps to its first cell.
- A cell edit still in progress is applied automatically when adding, deleting and saving. After deleting, the previous row is selected.
- The selected row is highlighted in the chart; a click in the chart selects the nearest point in the table.
- As long as point changes are unsaved, the profile tree and the toolbar are locked - continue with **Save** or **Cancel**.

A folder or profile is selected by clicking it in the tree; new folders/profiles are always placed at that location (shown as the tooltip "Location: …").

Profiles and folders can be moved to other folders or to the top level (**Profiles**) by drag and drop; the change is saved immediately. It is not possible to move into the current parent folder, into the folder

itself or into one of its subfolders. With Ctrl or Shift click, several entries of a common folder can be selected and moved together.

Power in watts or % FTP

Power profiles specify the target power in either **watts** or **% FTP**; the **Einheit** (unit) selection (Watt / % FTP) is in the points editor. A %-FTP profile converts the values to watts while riding using the user's FTP (see *Users*), so it can be used by riders of different ability. When you switch the unit, the points are converted; this requires an FTP to be stored for the user. Without an FTP, a %-FTP profile cannot be started - ErControl points out the missing value. Heart-rate profiles always specify their target values in % of maximum heart rate.

Gradient colors in the elevation profile

The elevation profile of a topographic profile (also in the profile view of the training window) is colored according to the average gradient of each route section:

Color	Gradient	Meaning
	below 0 %	downhill
	0 % to below 3 %	flat
	3 % to below 6 %	moderate
	6 % to below 9 %	steep
	9 % to below 12 %	very steep
	12 % and above	extremely steep

Each colored area stands for the average gradient of a section of at least 30 m. The further you zoom out, the longer the sections become (at least about 4 pixels wide): this keeps a coherent color picture even on very long routes instead of color noise. A short steep stretch therefore disappears in the averaging in the overall view and only becomes visible when you zoom in. The shape of the elevation profile itself remains unchanged.

Operating the chart

- **Zooming**: The mouse wheel zooms the chart in and out along the route (along the time axis for heart rate and power profiles).
- **Panning**: Drag with the right mouse button held down to move the visible section to the left or right.
- Zooming and panning only work along the route or time axis. For topographic profiles, the elevation axis automatically adapts to the visible section (with a minimum span of 40 m); when the whole route is visible, the overview scale applies again. For heart rate and power profiles, the value axis stays scaled to the entire curve.
- **Tooltip**: A click in the chart shows the values at that point. For topographic profiles these are kilometers, elevation in m and gradient in % (e.g. `12.3 km · 456 m · +4.5 %`), for heart rate and power profiles the time as m:ss, from one hour on h:mm:ss (e.g. `75:30` or `1:15:30`) and the target value with its label and unit (e.g. `Power (W): 180`).

Actions

- **Start training** – starts a training session with the selected profile. Heart-rate and power profiles open the same training window as Free Training (see *Starting Free Training*); topographic profiles first open the *start window* and then the 3D training window (see *Training window*).
- **Play profile** – topographic profiles only: rides the profile automatically, see *Map and route preview (topographic profiles)*. The button switches to **Stop** in the meantime.
- **New Folder** – creates a new folder at the current placement location.
- **Heart-rate profile** / **Power profile** – creates a new, empty heart-rate or power profile, which you then fill with values via the points editor and apply with **Save** (**Cancel** discards unsaved changes).
- **Import** – opens a menu, see *Import and export*.
- **Export** – opens a menu, see *Import and export*.
- **Delete** – permanently deletes the selected profile, or the folder along with its contents, after confirmation. If a profile has already been ridden in a training session, it (and any folder containing it) is protected from deletion.

When you create a power profile from a training session in the *Training Overview*, you are automatically taken to this Profiles page afterwards.

Import and export

An import always creates a new profile at the current storage location. The menu item **GPX-Import** reads a GPX file as a topographic profile. **Workout-Import** reads workout files in the formats ZWO (Zwift), MRC, ERG and FIT (Garmin) as a power or heart-rate profile: ZWO and MRC are created as a profile in % FTP, ERG as a profile in watts. FIT workouts with targets in watts, % FTP or % of maximum heart rate (the latter result in a heart-rate profile) are also accepted. Ramps are resolved into steps of 30 seconds each, repetitions are unrolled. Steps that ErControl cannot implement (for example zones or heart-rate targets in bpm) keep the previous target; a notice lists such skipped sections after the import.

The menu item **Export** writes a heart-rate or power profile as a **FIT workout** (e.g. for Garmin Connect or Garmin devices), or a topographic profile as a **GPX track** with elevation; the descriptions of the profile points become waypoints.

Map and route preview (topographic profiles)

For a topographic profile, the profile view shows a 3D map of the route above the elevation profile (for operating the map, see *Training window → Map view*). The route is built from the GPS coordinates of the imported GPX file; without GPS coordinates the map shows the message “Keine Strecke mit GPS-Koordinaten vorhanden.” (no route with GPS coordinates available).

- **Aiming**: when you move the mouse over the elevation profile, a vertical guide line with a tooltip (kilometer, elevation in m, gradient in %) appears. A marker moves along on the map. A click pins the marker at that spot, another click releases it.
- **Rider view**: the **Fahrer** (rider) button tilts the camera onto the route and follows the aimed point in the direction of travel. This lets you “ride” the route in advance. **Vogel** (bird’s-eye) switches back to the overview.

- **Play profile**: the **Play profile** button moves the marker automatically along the whole route; in the rider view the camera follows. A run takes at most 2 minutes - longer profiles are played back correspondingly faster. **Stop** (or switching the profile) ends the playback.

Start window for topographic profiles

For a topographic profile, **Start training** first opens the **Topographisches Profil starten** (start topographic profile) window with the elevation profile and the question of where the training should begin:

- **Bei 0 km starten** (start at 0 km, preselected) or
- **Bei folgender Startdistanz starten** (start at the following start distance): the start distance is either entered in km (in mi with imperial units, see *Units*) in the field or set by clicking on the elevation profile (the guide line with tooltip works as above). A dashed red mark shows the chosen spot.

Start opens the 3D training window, **Abbrechen** (cancel) closes the window without starting a training. Multiple "stages" of a profile no longer exist: whoever rides a long profile in parts simply chooses, next time, the start distance where they stopped last. Each ride appears as a training of its own in the *Training Overview*.

The same start window also opens via **Continue** or **Continue profile at x km** in the *Training Overview* and the *Training Detail* - already pre-filled with the end position of the continued training as the start distance, which can still be changed here before starting (see *Continue Profile*).

2.6 Training window

The training window opens as soon as a training starts (Free Training, heart-rate/power profile, or topographic profile). At the top it shows the **value bar** with the current metrics, below it charts or maps depending on the training type. Two buttons are located at the top right: the gear icon for the *settings during training* and the question mark for the *keyboard shortcuts*.

Free training and heart-rate and power profiles show two charts below the value bar, one above the other: heart rate on top (60 % of the height by default, with the *heart-rate zones* as background bands and, for a heart-rate profile, the target curve), below it (the rest) power (axis on the left, with the target curve for a power profile) together with cadence on an axis of its own on the right. Both charts share the same time axis. The split can be changed in the *settings panel*. For a heart-rate or power profile they show the whole profile with a little margin at the end at the start; if the training runs beyond it, the window scrolls on. The time window can be changed with the keyboard, see *Keyboard shortcuts during training*. A click in the chart shows the time as m:ss (h:mm:ss from one hour on) and the measured value with label and unit (e.g. **Power (W): 180**). Topographic profiles run in a window of their own with 3D maps, see *Topographic training*.

Value bar

The value bar shows, in this order, heart rate, power and cadence, plus speed, the calories burned (in kcal only), the distance (header **Distance**) and, for topographic profiles, the remaining distance. Both distances are displayed to the nearest 10 m (two decimal places in km). The units are uniformly **bpm** (heart rate), **W** (power) and **rpm** (cadence); speed uses the same purple as its curve in the chart. Time appears compactly as m:ss, with an hours digit only from one hour on (h:mm:ss). While virtual gear shifting is active, the value bar shows the still-unthrottled target power in place of the watt unit below the power value (e.g. **→ 180 W**), see *Virtual Gear Shifting*. For a heart-rate profile, the same spot shows the target power most recently set by the heart-rate control (initially the user's starting power),

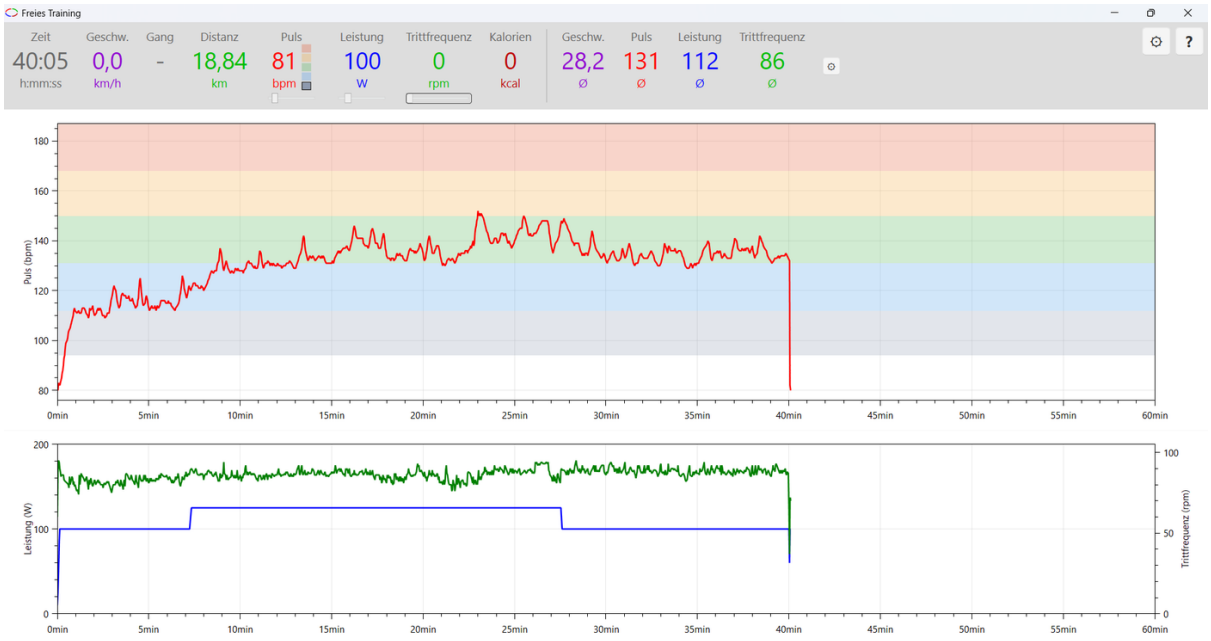


Fig. 10: Training window during a free training: value bar on top, below it the heart rate chart with heart rate zones and the chart for power and cadence.

so you can see what the control is currently asking of the ergometer. Likewise, for a heart-rate profile the current target heart rate appears below the actual heart rate instead of the bpm unit (e.g. **→ 126 bpm**), and for a power profile the target power of the profile appears below the actual power (e.g. **→ 100 W**).

Average values

To the right of the current values, the value bar shows four more columns with the running averages of the training for speed, heart rate, power and cadence. They use the colors of the respective instantaneous values, a **Ø** takes the place of the unit, and a vertical line separates them from the instantaneous values. They can be hidden with the **Show average values** setting under **Settings → Training → Value bar** or in the training's settings panel; the change takes effect immediately. Like the scaling, the setting applies to this Windows user account on this PC and is on by default.

Heart rate zones

Next to the heart rate tile, a vertical bar shows the five *heart rate zones* in their colors (Recovery, Light, Medium, Hard, Maximum, each from bottom to top). The zone your current heart rate is in is fully opaque and highlighted with a frame, the others are dimmed. A maximum heart rate must be entered for the user. In the chart of the running training, the zones lie as lightly tinted bands behind the heart rate curve.

The size of the value bar can be adjusted in 5 % steps between 50 % and 300 %:

- live during training with **Numpad *** (larger) and **Numpad /** (smaller) or with **Ctrl + mouse wheel** - this also works over the 3D map,
- or permanently under **Settings → Training → Value bar → Scaling**.

Every change is saved immediately and applies again at the next training. The setting applies to this Windows user account on this PC, because the suitable size depends on the screen.

Simulator sliders

If a training runs without a real ergometer (connection dialog: continue with simulated data), three sliders appear below the tiles of the value bar:

- **Cadence** (0-160 rpm),
- **Heart rate** (60-200 beats/min) - locked when the heart rate already comes from a connected heart-rate monitor,
- **Power** (within the *power range* of the active training device, by default 25-400 watts in 5-watt steps) - locked for heart-rate and power profiles (there the power comes from the profile or the heart-rate control) until the end of the profile is reached - after that the power can be set freely again - and while the virtual gear shifter is active (the power then results from cadence and gear).

The gear symbol to the right of the tiles (tooltip **Varianz**, variance) opens a popup with two further sliders (0-10) for the **variance** of cadence and heart rate - this makes the simulated values fluctuate slightly, like real measurements.

Training with a %-FTP profile

A power profile in % FTP only starts if an FTP is stored for the user; otherwise a notice appears (see *Power in watts or % FTP*).

Coasting and recording

If you stop pedalling (cadence 0) but the training is still running (the display clock keeps running, speed is still above 0), ErControl records training points with cadence 0 and continues the averages with 0. In true standstill nothing is recorded.

ErControl writes the recorded training points to the database at most every 5 seconds, and everything when the training ends. If ErControl crashes or is terminated abruptly, at most the last 5 seconds of the recording are lost.

Settings during training

The gear icon at the top right (or **Numpad ,**) opens a settings panel without interrupting the training. Changes take effect immediately and are saved permanently shortly after the last change, at the latest when the training window is closed - no save button is needed. A click next to the panel, on the gear icon, or **Esc** closes it again.

The panel contains:

- **Virtuelle Gangschaltung verwenden** (use virtual gear shifting, Numpad 0) plus **Leistung 1. Gang bei 0 % Steigung** (power for gear 1 at 0% gradient), **Schrittweite zwischen den Gängen** (step between gears), **Realitätsfaktor bei Steigung** (reality factor for gradient) and **Maximalgeschwindigkeit** (maximum speed) - see *Virtual Gear Shifting*.
- **Automatik aktivieren** (enable automatic shifting) together with the shifting limits **Herunterschalten bei mehr als** (shift down above) / **Heraufschalten bei weniger als** (shift up below) (in watts). Automatic shifting is only active when a profile is loaded and the gear shifter is switched on; in Free Training the panel shows a note on this. The initial value of the automatic mode is the one last set.

- **Höhe Pulsdiagramm** (heart rate chart height): space for the heart rate chart as a percentage of the window height (30-80 %, default 60 %); power and cadence get the rest. The change takes effect immediately and applies to this Windows user account on this PC. Only for Free Training and heart-rate/power profiles; topographic profiles have a fixed split.
- **Erholungspulsmessung einschalten** (enable recovery pulse measurement) and **Trainingsdaten automatisch speichern** (save training data automatically).

For heart-rate and power profiles the gear shifter group is omitted (the profile dictates the power); the panel points this out.

These are the same values as under *Settings* - whatever is changed during training is changed there as well.

Help: keyboard shortcuts

The question mark at the top right (or **F1**) shows all keyboard shortcuts that actually apply in the current training. The list adapts to the training type and state - for example, the gear shifter keys are missing for a heart-rate profile, and the automatic mode only appears with a profile. Help and settings panel close each other, **Esc** closes both. The complete overview can be found under *Keyboard shortcuts during training*.

Topographic training

Topographic profiles always start in the 3D training window. Beforehand, a start window asks where on the route the training should begin, see *Profiles*.

Layout



Fig. 11: Topographic training: driver view and overview map on top, zoom view and full elevation profile below. Map data: © OpenStreetMap contributors.

- **Top left**: the rider view - a 3D map whose camera follows the rider along the route. The rider stays fixed in the lower third of the image, the view points in the direction of travel. Moving the

map with the mouse is deliberately disabled in the rider view. Controls: base map and distance slider, see *Map view*.

- **Top right**: the same 3D map as a fixed bird's-eye view of the entire route; only the position marker moves along. Controls: base map and tilt, see *Map view*.
- **Bottom left**: a zoomed view of the elevation profile around the current position. The visible route section can be changed with **Numpad 4** (closer) and **Numpad 6** (zoom out) in steps from 200 m to 50 km. **Numpad 5** shows or hides marker symbols in the elevation profile.
- **Bottom right**: the elevation profile of the entire route, colored by gradient (see *Profiles*).

A click in one of the elevation profiles shows kilometers, elevation and gradient at that point. Zooming and panning with the mouse are not available here - set the visible section of the zoom view with Numpad 4/6.

The splitters between the areas can be moved with the mouse. Their positions as well as the chosen zoom level of the profile zoom view are remembered and restored at the next training.

Unlike Free Training and heart-rate/power profiles, this window does not show a heart-rate/power/cadence curve - the space belongs to the maps and profile views.

Map view

The 3D maps have buttons at the top left. Which of them are visible depends on the map:

Buttons	Profile view (*Profiles*)	Training window: rider view (top left)	Training window: overview map (top right)
Base map: **Standard** (street map), **Satellit** (satellite image), **Topografie** (topographic map)	yes	yes	yes
Tilt: **2D** (top-down view), **45°**, **60°**	yes	no	yes
Camera mode: **Vogel** (bird's-eye view of the whole route), **Fahrer** (camera follows the position)	yes	no (fixed rider view)	no (fixed bird's-eye view)
Abstand (distance) slider (value 12-16 in 0.5 steps, default 14; higher values mean a closer camera)	only in the rider view	yes	no

The distance is a setting for this Windows user account and can also be changed during training via **Numpad 1 / 2 / 3** (closer / default / further away). The choice of base map and tilt is remembered for the next time the map is opened; the camera mode, in contrast, always starts in the bird's-eye view.

The **i** button at the bottom right shows the sources of the map currently displayed. All map data comes from third parties and is subject to their terms of use; the satellite image is released for non-commercial use only. An internet connection is required for the maps - during brief dropouts only individual tiles are missing, and the map remains usable.

At the finish

When the ride reaches the end of the profile, ErControl freezes distance and recording: no further training points are recorded and the average values stay as they are. You end the training as usual with the stop button. Heart-rate and power profiles, by contrast, simply keep running after the profile duration has elapsed: the profile control has then ended, the ergometer keeps the power last sent, and the target value displays (**→ N W**, **→ N bpm**) in the value bar disappear. Once the end of the profile is reached (finish or elapsed profile duration) and cadence is 0, speed stops immediately instead of coasting on; the orange coasting indicator only appears while the bike is actually rolling. In free training and with heart-rate and power profiles, speed is set to 0 immediately at cadence 0 (coasting only happens in topographic training).

Recorded distance

The distance of a topographic training always counts from 0, regardless of the chosen start distance on the profile: it is the odometer of the training itself. If a training begins at km 20 of the profile, for example, the training overview shows 5 km after 5 kilometers ridden - elevation, gradient and position on the map, however, still follow the absolute position on the profile.

2.7 Users

Under **Users** you manage the users set up in ErControl and their master data. The page is opened via the entry of the same name in the navigation bar of the main window, right below *Profiles*.

> **Note**
>
> This page is only for managing user data. Who is currently logged in (and whose trainings/profiles are shown in *Training Overview* and *Profiles*) is determined on the login screen at program start, not here. The first user of a new database is created via a dialog of its own with the same fields, see *First start: database and first user*; there is no automatically created administrator account.

Layout

- On the left, a list of all users.
- On the right the master data of the selected user: user ID, first name, last name, date of birth, sex (male, female or diverse), weight, resting heart rate, maximum heart rate, starting power and FTP. The weight is entered in the unit chosen under *Settings → Units* (kg, lb or stones and pounds) and stored with one decimal place (0.1 kg).
- A **Heart Rate Zones** field shows the five ranges calculated from the maximum heart rate as a color bar with a legend, in beats per minute, see *Heart rate zones*; the values update automatically as soon as date of birth, sex, weight, or maximum heart rate are changed.

If no maximum heart rate is entered, ErControl suggests a value based on age, weight, and sex ("calculated: …"); **Apply** copies this suggestion into the maximum heart rate field. For "diverse" the average of the constants for male and female is used.

The **FTP** (functional threshold power, in watts) is optional: the power you can sustain for about an hour, e.g. 95 % of the average power of a 20-minute test. It converts power profiles in % FTP into watts (see *Profiles → Power in watts or % FTP*). When a training starts, ErControl saves the current FTP with the training.

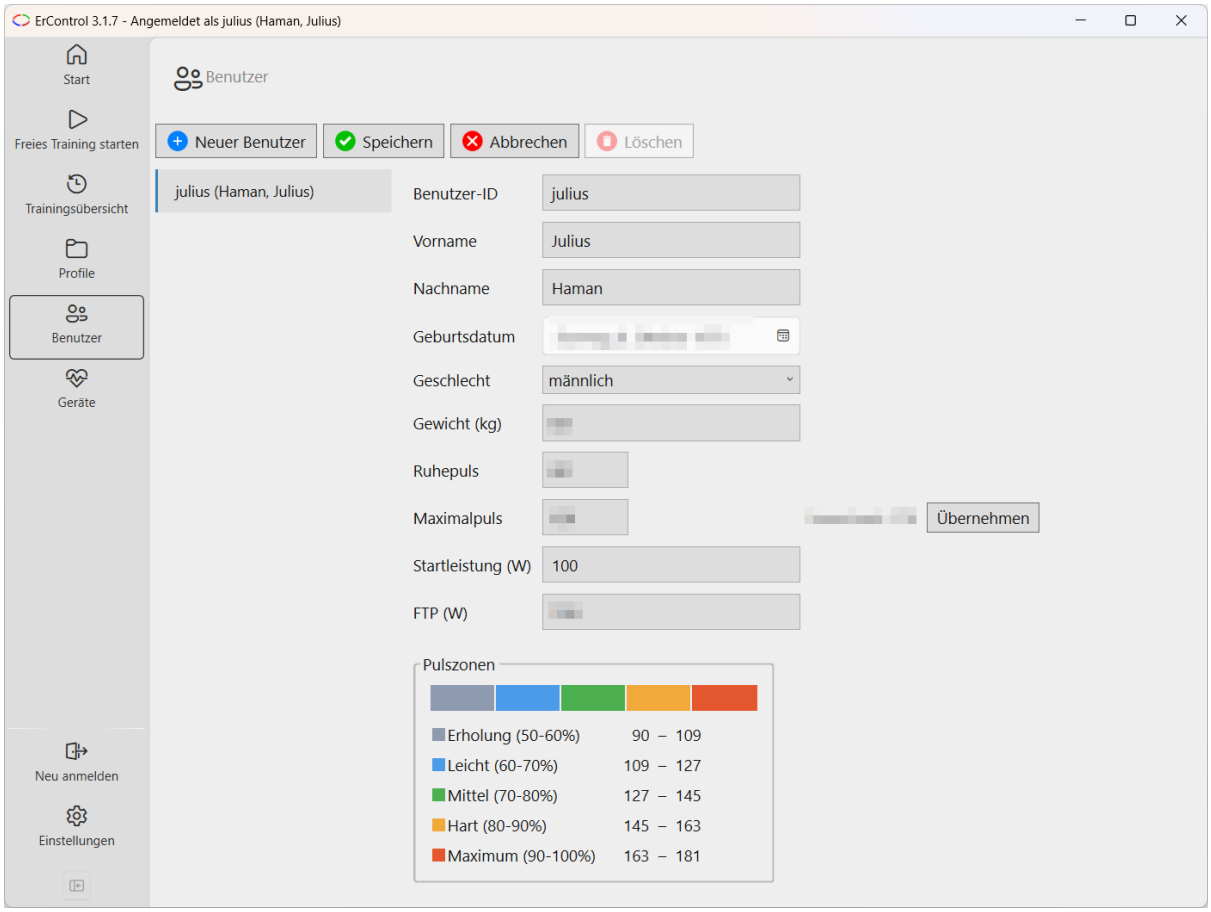


Fig. 12: User management: user list on the left, master data and heart rate zones on the right.

Heart rate zones

ErControl divides the heart rate into five zones of equal width, 10 % of the maximum heart rate each. Every zone has a fixed color that recurs throughout ErControl - in user management, in the heart rate tile of the value bar, as background bands in the charts and in the heart rate zone pie chart of the *Training Detail*. The colors are the same in the light and dark appearance.

Color	Zone	Share of maximum heart rate
	1 – Recovery	up to 60 %
	2 – Light	60–70 %
	3 – Medium	70–80 %
	4 – Hard	80–90 %
	5 – Maximum	from 90 %

The colors run from cold to hot: gray-blue for Recovery, blue for Light, green for Medium, orange for Hard and red for Maximum. The Recovery zone covers everything below 60 % of the maximum heart rate (labeled 50–60 % in the legend), the Maximum zone everything from 90 %.

The **resting heart rate** is recorded together with the master data. It does not yet affect the calculation of the zones, but is saved with every training (see below) and is the basis for a later, optional calculation method.

> **Note**
>
> **Zones of old trainings stay stable.** When a training starts, ErControl saves the maximum and resting heart rate valid at that time in the training. The heart rate zones of a training in the *Training Overview* and the *Training Detail* are calculated with these saved values - if your maximum heart rate changes later, older trainings remain unchanged. For trainings recorded before this feature existed, the value from the user profile is used as an approximation.

Actions

- **New User** – creates a new user, who immediately appears in the list and can be edited.
- **Save** – applies changes to the master data of the selected user. The button is only active while there are unsaved changes; if you change a value back to its old value, there is no change any more.
- **Cancel** – discards changes that have not been saved yet. This button, too, is only active while there are unsaved changes. The page stays open.

If changes are still open when you switch users, click **New user**, switch to another page, click **Sign in again** or close ErControl, a dialog asks what to do: **Save**, **Discard** (the changes are lost) or **Cancel** (you stay on the page).

- **Delete** – permanently deletes the selected user after confirmation. The currently logged-in user, as well as users who have already completed training sessions, cannot be deleted.

2.8 Virtual Gear Shifting

With the virtual gear shifting, cadence on the bike ergometer no longer translates directly into a target speed - instead, the selected gear determines a power that ErControl sends to the ergometer, similar to a real bicycle gearshift, where a higher gear demands more force at the same cadence. Toggle on/off with **Numpad 0** (see *Keyboard shortcuts during training*); has no effect with a heart rate or power profile, since the profile already dictates the power there.

Power per Gear

Each gear has a fixed power at 0% gradient:

Power(gear) = base power + (gear − 1) × step

Gear 1 therefore always equals exactly the base power, and every gear above or below it differs by exactly one step. You set both values under *Settings* (Ergometer tab, **Gear Shifting** group) or directly during a running training via the settings panel (gear icon at the top right, see *Training window*) - the defaults are 75 watts base power and 25 watts step.

Going uphill, a gradient surcharge is added, weighted by the **reality factor** (10-100%, default 40%): at 0% gradient the surcharge is always 0, and it grows with a steeper gradient - by the same amount for every gear, so the power gap between two neighboring gears stays exactly the step at any gradient. Going downhill, the surcharge is dropped entirely - the full power of the gear at 0% gradient always applies.

As everywhere in ErControl, the power actually sent is rounded and clamped to the *power range* of the connected training device.

Coasting

As with a real bicycle gearshift, coasting kicks in as soon as you stop pedaling (cadence 0) or go faster than the configured **maximum speed** (20-120 km/h, default 70 km/h; with imperial units it is shown and entered in mph, see *Units*): ErControl then sends no more power, and speed follows solely from rolling resistance, air resistance and gradient. The display highlights the coasting state in orange while the bike is actually rolling; it does not appear once speed is 0. At the end of a profile (finish reached or profile duration elapsed) the speed stops immediately when cadence is 0 instead of coasting on. The **Stop** key (see *Keyboard shortcuts during training*) lets you force the speed to 0 at any time, for example to trigger the recovery pulse measurement in the middle of a coasting descent.

Shifting

With **Numpad +** and **Numpad -** (see *Keyboard shortcuts during training*) you shift one gear up or down. There is neither a fixed number of gears nor a separate setting for gears below gear 1: how far you can shift up or down is determined anew at every gradient by whether the power required for it still lies within the power range of the connected training device - depending on gradient, that may reach below gear 1 (0, -1, …) or beyond the previously usual highest gear, and can shift while riding as the gradient changes. Every training session starts in gear 1.

A change takes effect immediately - the new target power appears right away in the value bar, without waiting for the next one-second tick.

You can also enable automatic gear shifting (**Numpad 9**), which shifts down automatically when an upper watt limit is exceeded and up automatically when it drops below a lower limit - see *Settings* or *Training window*.

Power Increase Dampened

An increase in target power (for example when leaving coasting or shifting up) is ramped gently, at most 80 watts per second, so resistance doesn't jump abruptly. A decrease in power, on the other hand, always takes effect immediately.

Display in the Value Bar

While virtual gear shifting is active, the value bar shows the still-unthrottled target power in place of the watt unit below the power value, for example → **180 W** - so you can see where the ramp is heading, without taking up extra space.

Speed

As without gear shifting, the displayed speed follows solely from the power actually sent: on the bike it eases into it rather than jumping instantly, and coasting uses pure rolling physics with no power input. The cross-trainer has no coasting concept and no inertia - cadence 0 simply means standing still there, otherwise speed follows power directly.

2.9 Devices

The devices area is reached via **Devices** in the main navigation and is split into two tabs: training devices and heart rate monitors. Applies only to the currently logged-in user.

Any number of named devices can be created per tab, but exactly one is marked **active** (star) - that's the device actually used when training starts. An active training device is required; an active heart rate monitor is optional.

All changes (name, connection type, ANT+ number, COM port) are applied immediately - there's no more Save/Cancel.

Each row in the list additionally shows an icon for the connection type (ANT+, BLE or serial). The icons are tinted subtly: Bluetooth blue, ANT+ orange, COM neutral gray. The colors apply regardless of selection and skin.

Training devices

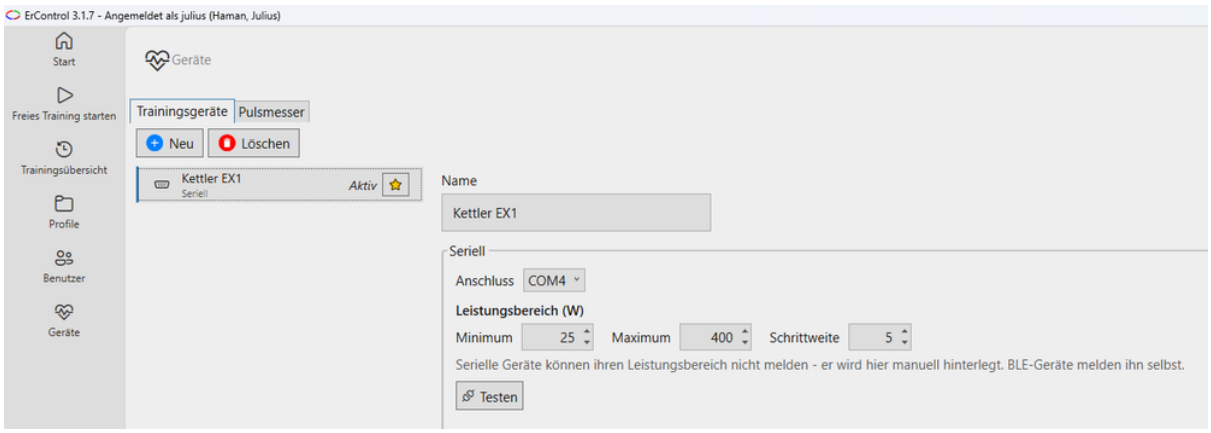


Fig. 13: **Training devices** tab: list on the left, detail area with port and power range on the right.

- List of created devices on the left, detail area on the right. Buttons **New** and **Delete**.

- **New** opens the device selection (see below) - only an actual selection creates the device, using the display name of the device found (assigned automatically for serial).
- **Name** can be changed at any time.
- **Connection type**: *serial*, *ANT+ FE-C*, or **BLE** (Bluetooth, for trainers with *BLE FTMS* or *Tacx FE-C over Bluetooth*), changeable at any time. Depending on the selection, a matching section with a **Test** button appears:
  - **Serial**: select a COM port; Test connects over it on a trial basis. If the saved port is not present on the computer (for example because the USB adapter is unplugged), it still stays in the **Port** selection, with the note "not available". While the Devices view is visible, ErControl re-reads the list of ports every 2 seconds: if you plug in the adapter or the ergometer later, the note disappears by itself. The *power range* is entered by hand here. When connecting, ErControl tries the baud rates 57600 and 9600 and remembers per device the rate that worked last; it is tried first on the next connection, so the wait for the wrong rate is saved.
  - **ANT+ FE-C**: The device number is only set through the device selection under "New" and is read-only here - create a new device for a different one. Test connects on a trial basis via ANT+ against that number. Without a number, Test is disabled. Here, too, the *power range* is entered by hand.
  - **BLE**: device name and address are only set via the device selection under "New" and are read-only here - create a new device for a different one. Test connects against the stored address; without an address, Test is disabled. On connecting, ErControl additionally reads the power range (minimum, maximum, step size) reported by the device and uses it for power control, if the device supports it - otherwise the default values (25 / 400 / 5 watts) apply, see *Power range*. If Windows already knows the device, ErControl establishes the connection immediately. Otherwise it waits up to 5 seconds before connecting for the device to announce itself via Bluetooth (advertisement) and otherwise tries again. For this the device must be switched on and within range and, as a rule, should not be connected to another program. ErControl itself detects on connecting whether the device speaks the *BLE FTMS* standard or the Tacx service *Tacx FE-C over Bluetooth* - FTMS takes precedence. For you both ways are simply "BLE"; an ANT+ stick is not needed for Tacx trainers over Bluetooth. A Tacx trainer does not report a power range over this way, the default values apply (see *Power range*).
- The "first device found" option no longer exists - every device has a fixed address or device number.
- Star button per row: marks the device as active. The active device cannot be deleted.
- When the first device is created, it becomes active automatically.
- After updating from a previous version, no training device appears in this list yet - only when training is actually started for the first time is a device named "Migrated" automatically created from the previous settings (connection type, port or BLE address) and set active. The former setting **Maximum power** is carried over as the maximum of the power range; training devices that already existed received it during the update.

Power range

Every training device has a power range made up of **minimum**, **maximum** and **step size** in watts. ErControl uses it to limit and round every power value it sends to the ergometer: for power profiles, heart-rate control, the virtual gear shifter and *power control via the Numpad keys*. The power slider of the *simulator* in the training window follows it as well.

Where the range comes from depends on the connection type. ErControl uses the first source that supplies a value:

1. **BLE with FTMS**: the device reports the range itself and ErControl reads it on connecting. It only applies to the current session and is not saved.
2. **Serial** and **ANT+ FE-C**: ErControl cannot query a power range in watts from these devices. It is therefore entered by hand in the detail area under **Power range (W)** (default: 25 / 400 / 5 watts). Changes apply immediately. ErControl corrects implausible entries: the step size is at least 1 watt, the minimum is not negative and the maximum is not below the minimum.
3. **Default values** (25 / 400 / 5 watts) if a BLE device does not report a range - this also applies to Tacx trainers over Bluetooth without FTMS.

A missing reported range is not an error: the connection is still established and ErControl simply uses the next source. For a serial device the maximum is additionally used to discard implausible measured values above it.

Heart-rate control may reduce power all the way down to 0 watts, regardless of the minimum.

Heart rate monitors

Same layout as for training devices (list, detail area, New/Delete, star to activate).

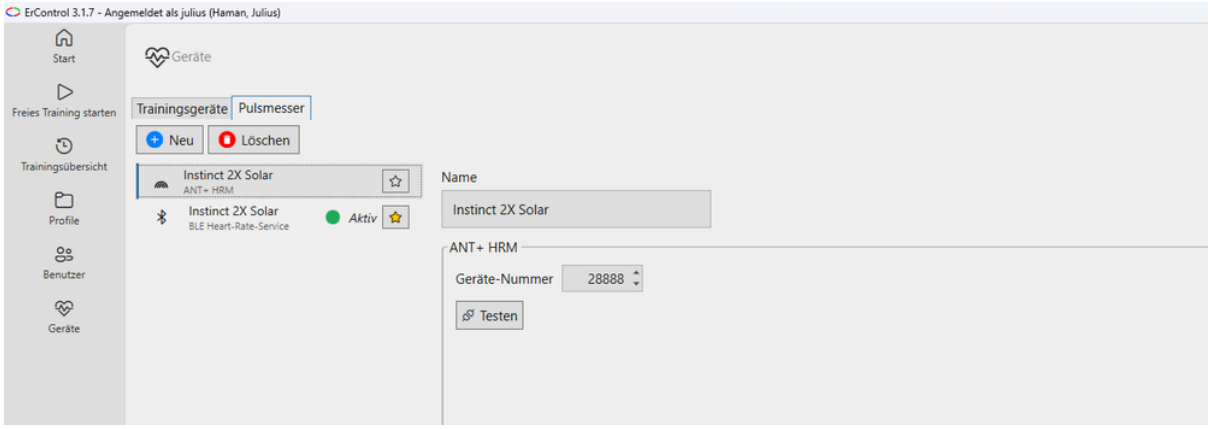


Fig. 14: **Heart rate monitors** tab: an ANT+ heart rate monitor (selected, with device number) and an active Bluetooth heart rate monitor.

- **Connection type**: *ANT+ HRM* or *BLE Heart-Rate-Service*.
  - **ANT+ HRM**: The device number is only set through the device selection under “New” and is read-only here - create a new device for a different one. Test waits up to 30 seconds for the first heart rate reading - success shows the measured heart rate, otherwise a “no sensor found” notice. Without a number, Test is disabled.
  - **BLE Heart-Rate-Service**: device name and address are only set via the device selection under “New” and are read-only here. Test connects against the stored address and like-

wise waits up to 30 seconds for the first heart rate reading - a watch that's merely reachable without an actively transmitting chest strap doesn't count as success. Without an address, Test is disabled. Here too, ErControl connects immediately if Windows knows the device, and otherwise waits up to 5 seconds before connecting for a message from the device; re-pairing after restarting the watch is therefore no longer necessary. For this, a watch must be transmitting the heart rate (broadcast).

- The "first device found" option no longer exists for heart rate monitors, whether ANT+ or Bluetooth.
- **Skin contact**: if a Bluetooth heart rate monitor reports that it has no skin contact, its value no longer counts as heart rate. After a few seconds the monitor is considered lost, as with missing data, and the change appears in the log. This only applies to devices that report this feature; some (for example the HRM200) do not report it and keep delivering apparent values without contact.
- One difference from training devices: clicking an already-active heart rate monitor again **deactivates** it, instead of making another device active.
- An active heart rate monitor is optional - without one, the heart rate measured by the ergometer itself is used, provided the ergometer supports it.
- **Presence indicator**: the list shows a dot for each Bluetooth heart rate monitor. Green and filled means: the device has announced itself within the last few seconds. Gray and empty means: not seen. For this, ErControl only listens passively to the devices' radio messages, does not establish a connection and shows no heart rate. The indicator only runs while the devices view is open and pauses during a training, a connection test and the device search.
- The devices overview itself does not establish a Bluetooth connection. Connections are only made via **Test**, in the "Connect devices" dialog and during training - a persistent connection of the overview would otherwise interfere with the test and the training.

Device selection

Opens via **New** and has the same layout for training devices and heart rate monitors:

- Switch between **ANT+** and **BLE** (for training devices, also **Serial** as a manual branch without scanning - creates the device directly, the COM port is then chosen in the detail area).
- Only devices that are actually transmitting or advertising during the scan appear. Selecting one adds the device to the list immediately.
- A device cannot be created just by typing in an ID or device number - **New** always searches (only Serial works without a search). The ANT+ device number and the BLE address stay read-only afterwards.
- Devices that are already added for this role (training device or heart rate monitor) stay visible in the list but are greyed out, marked **Already added** and cannot be selected. Matching uses the device number for ANT+ and the address for Bluetooth. The result rows are single-line; text that is too long is shortened with "…" and shown in full as a tooltip.
- **BLE**: for trainers that offer the Tacx service "FE-C over BLE" instead of FTMS (for example the Tacx Vortex Smart), the list shows the note **Tacx FE-C** after the name. The entry is created like any other BLE device.
- **ANT+**: The search ends on its own when no further device has been found for about 10 seconds and reports "No devices found." or "N devices found.". ErControl lists at most four devices per

search; after 90 seconds at the latest the search is aborted (the ANT+ stick may then not be responding). A heart rate strap appears as **ANT+ Pulsmesser (Geräte-Nr. …)** (ANT+ heart rate monitor, device no.).

- **Device no. and ID on the watch**: For the same sensor, a Garmin watch may show a longer ID (for example 560741). ErControl shows the shorter ANT+ device number; it is the remainder when the watch ID is divided by 65536 (560741 gives 36453).

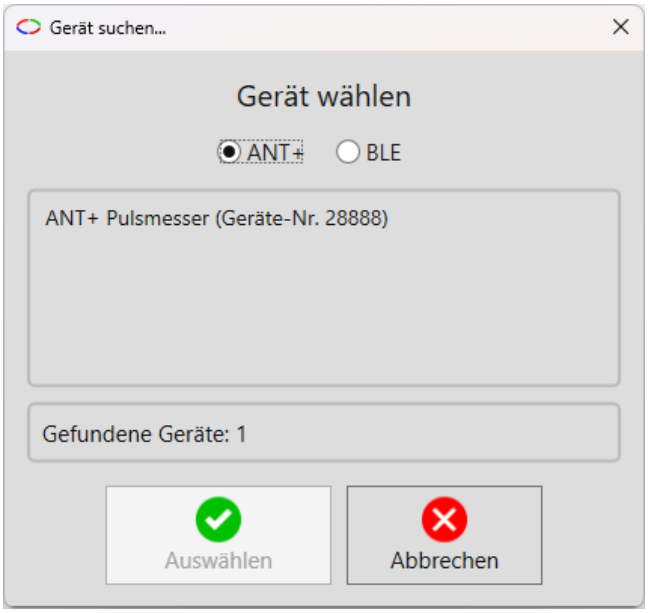


Fig. 15: Device selection for ANT+: devices found, with their device number.

Connection test

- Training device via Bluetooth, training device via ANT+, heart rate monitor via ANT+, and heart rate monitor via Bluetooth all run through the same test dialog: the status is shown live as text, the button starts as “Cancel” and turns into the green “OK” button on a successful test.
- Serial continues to use the familiar connection dialog (“Connecting devices…”) with retry logic - from the devices area only for the training device, while at actual training start also in parallel for an active heart rate monitor (red/green icon per device, “Continue with simulated data” as a fallback).

Requirement for ANT+

The connection tests for ANT+ FE-C and ANT+ HRM need `AntInterface.exe`. The setup installs it automatically with ErControl (see *Installation*) - after a normal installation, no further setup is needed. Under **Settings → ANT+ / AntInterface → AntInterface (base)**, the field shows the path actually used and is locked as long as the bundled file is present. If it is missing in an exceptional case (for example an incomplete installation), a different path can be entered there by hand; without a valid path, a corresponding error message appears when testing.

If no ANT+ stick is plugged into the computer, the device search for ANT+ heart rate monitors and trainers ends immediately with a note to plug in the stick and search again; it no longer runs until the timeout after 90 seconds. The tests for ANT+ heart rate monitors and trainers also end immediately with this note. In the “Connect devices” dialog when starting a training, the note appears instead of the endless search; “Continue with simulated data” remains possible there. The message from the ANT library is additionally written to the log.

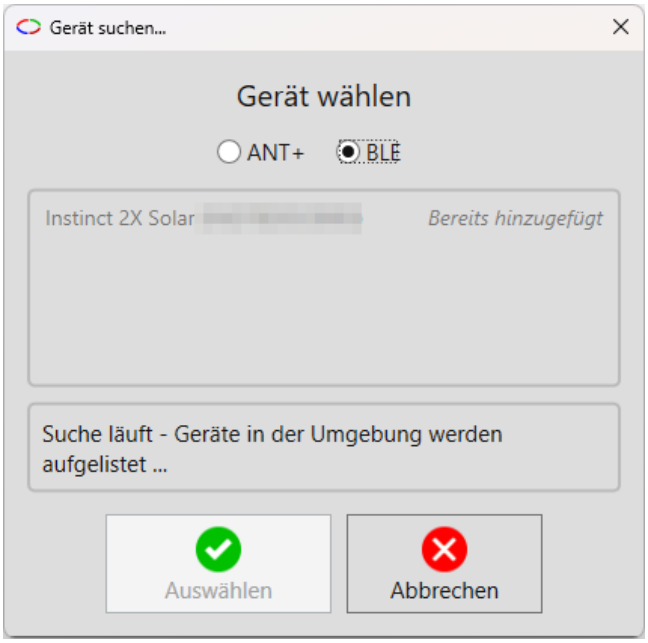


Fig. 16: Device selection for BLE: a device that already exists is greyed out and marked “Bereits hinzugefügt” (already added).

AntInterface version: after connecting, ErControl compares the program version and commit identifier of the AntInterface with its own values. If they do not match (for example after an incomplete update or with a path entered by hand that points to another version), ErControl terminates the AntInterface and shows the error with both versions in the connect dialog, in the connection test and in the device search. A clean installation with the setup of the matching ErControl version fixes this. In addition, ErControl terminates an orphaned AntInterface before starting, one that still holds the ANT+ stick after a crash, and the AntInterface now ends together with ErControl, even if ErControl crashes or is ended in the Task Manager.

2.10 Settings

The settings area is reached via **Settings** in the main navigation and is split into six main items, each with an icon in front of the name in the list on the left: Training, Ergometer, ANT+ / AntInterface (with the orange waves as in the device overview), System, Units and Strava. Changes only take effect once you click **Save**; **Cancel** discards them. This applies to all fields, including those that used to take effect immediately (for example **Login automatically**, log level, serial logging, the values bar and the Strava fields). Both buttons are only active while there are unsaved changes, and the page stays open. If changes are still open when you switch to another page or close ErControl, a dialog asks what to do: **Save**, **Discard** or **Cancel**.

Training

Controls behavior during and after training. Applies only to the currently logged-in user.

- **Recovery heart rate**: When enabled, the recovery heart rate is automatically measured at the end of training (cadence = 0) and the fitness score is stored in the database.
- Turn automatic saving of training data on or off.
- **Value bar → Scaling**: size of the value bar in the training window as a percentage (50-300 %, in 5 % steps). Applies to this Windows user account, because the suitable size depends on the

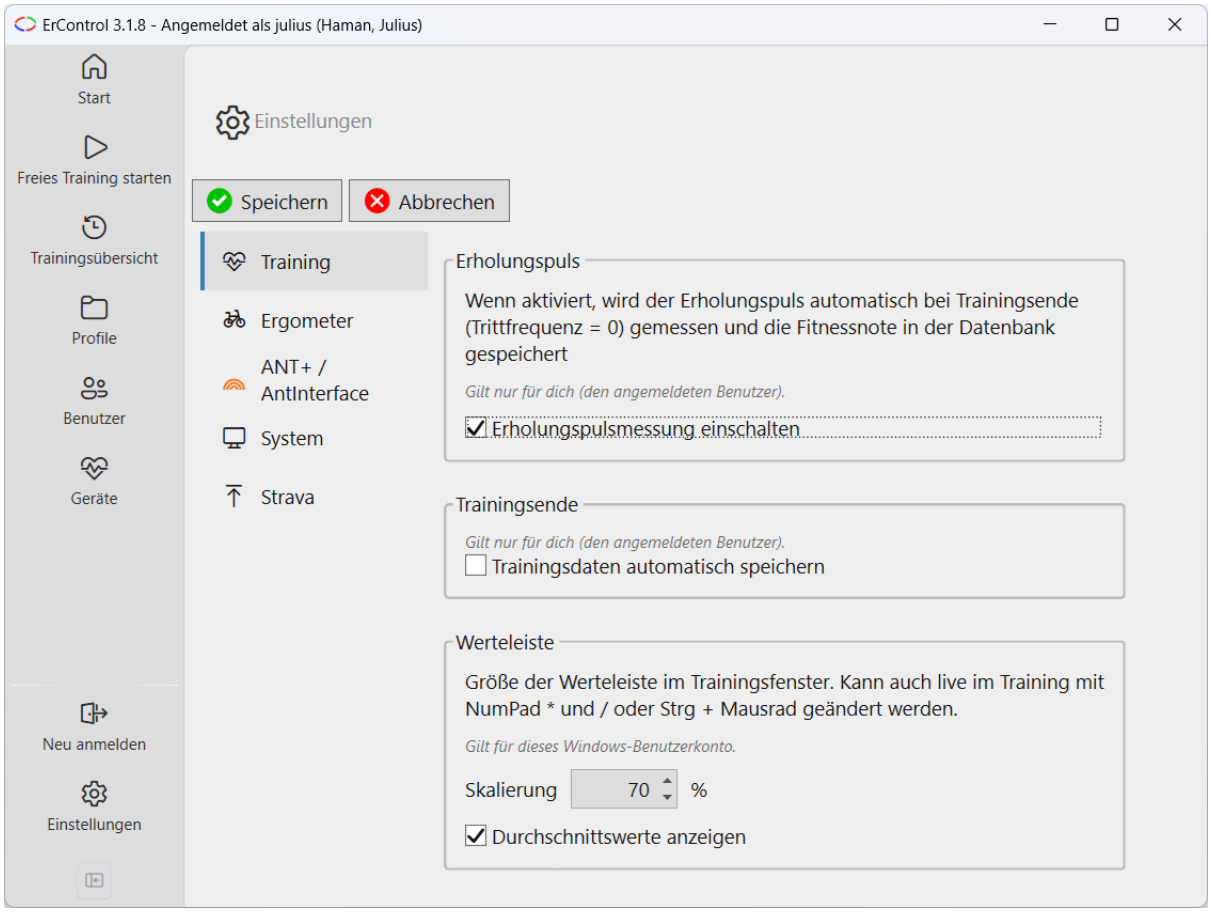


Fig. 17: Settings, **Training** tab.

screen. It can also be changed live during training (Numpad *, Numpad / or Ctrl + mouse wheel), see *Training window*.

- **Value bar → Show average values**: shows or hides the running averages on the right of the value bar (default: on). Like the scaling, it applies to this Windows user account, see *Average values*.

The settings for recovery pulse, automatic saving and gear shifter can also be changed directly during a running training via the gear icon; changes take effect immediately there and without **Save**, see *Training window*.

Ergometer

Hardware-level settings for the ergometer. Applies only to the currently logged-in user.

- The former setting **Maximum power** is gone: the power range (minimum, maximum, step size) is now set per training device under *Devices*.
- **Ergometer type**: bike or cross-trainer, plus the efficiency (16.7 %, 12.5 %, or custom).
- **Gear Shifting**: **Power for gear 1 at 0% gradient** (base power, 25-400 watts, default 75 watts), **step between gears** (1-100 watts, default 25 watts), **reality factor for gradient** (10-100%, default 40%) and **maximum speed** (20-120 km/h, default 70 km/h, above which coasting kicks in going downhill; with imperial units the field is shown and entered in mph), plus automatic gear shifting with watt limits above/below which it shifts down/up - see *Virtual Gear Shifting*.
- **Power control via PC only**: with gear shifting turned off, the gear-up/-down keys (Numpad +/-) directly adjust power in steps of the active training device's step size (default: 5 watts) instead of shifting gears. Intended for ergometers whose own buttons on the device stop responding once it has been controlled by the PC. Applies only to Free Training and the topographic profile, not to the power/heart-rate profile (there the profile dictates power anyway). See *Keyboard shortcuts during training* for all keyboard shortcuts during training.
- **Resistances**: physical parameters for the route simulation - rolling resistance coefficient (cr) and effective air drag (cw·A), with a reset button back to the default values.

The two values determine how "tough" the route simulation is: the higher cr and cw·A, the more power riding on flat terrain demands (or the lower the simulated speed at the same power). The following ranges, based on real values from road cycling, serve as a guide:

Use case	cr	cw·A
Default (road bike, time-trial/aero position)	0.006	0.25
Road bike, time-trial/aero position	0.003–0.006	0.25
Road bike, normal racing position (drops)	0.003–0.006	0.30–0.35
Road bike, upright position (hoods)	0.003–0.006	0.35–0.40
Touring bike / commuter, upright	0.008–0.010	0.40–0.50
Mountain bike, knobby tread (gravel/trail)	0.010–0.020	0.45–0.60

These ranges are guidelines - cw·A also depends on the rider's height and build (taller/heavier riders have a larger frontal area); the simulation additionally assumes a bike weight of 10 kg and smooth road-racing tires. If you want a realistic "on the road" feel, keep the default values; to simulate more of a touring-bike or MTB character, the higher values in the table are the right choice. Easy starting point: the reset button always brings you back to the defaults (road bike, aero position).

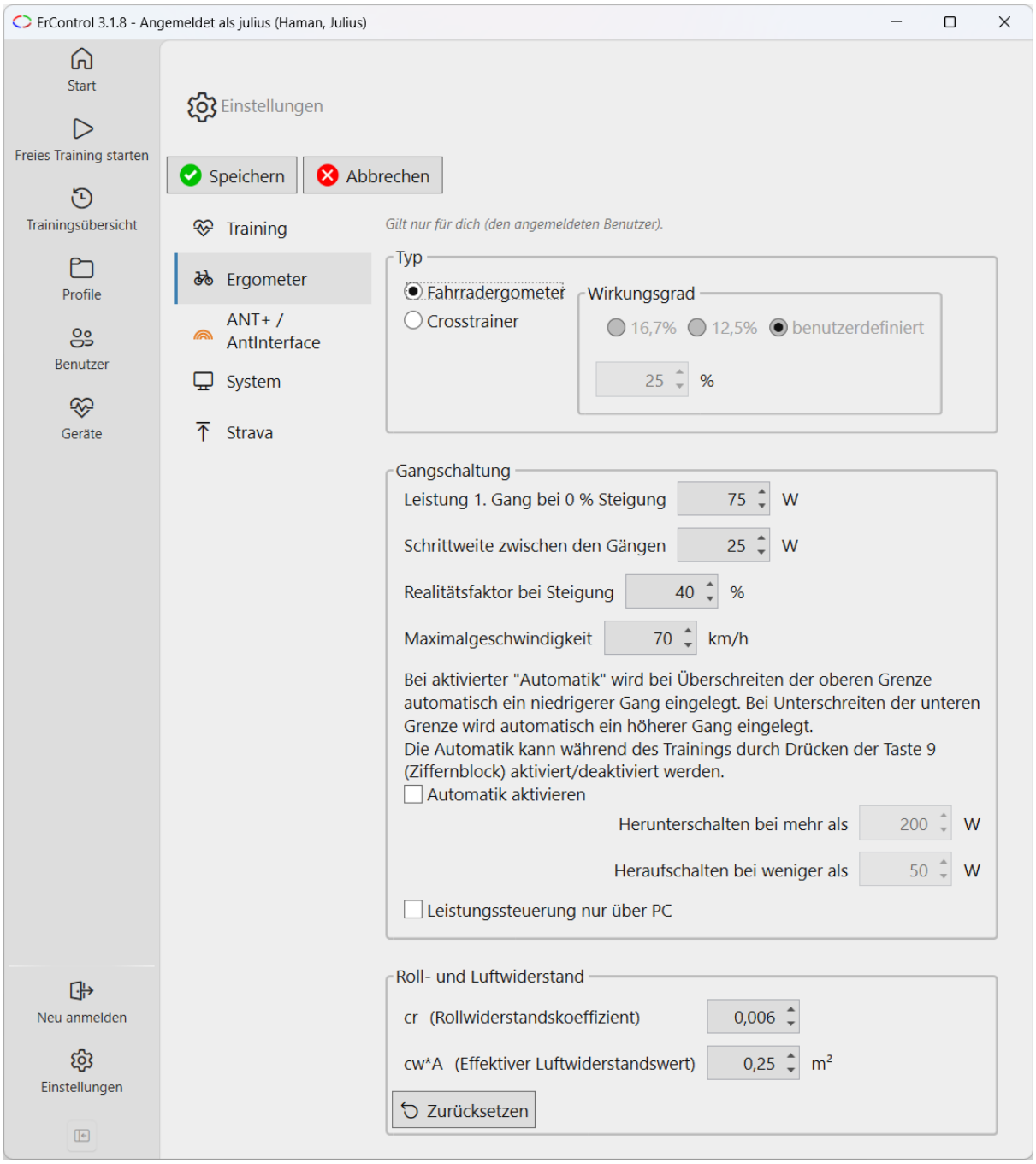


Fig. 18: Settings, **Ergometer** tab.

ANT+ / AntInterface

Connects to the external `AntInterface.exe`.

AntInterface (base)

Establishes the ANT+ connection for trainers (FE-C) and heart rate monitors selected in the **Devices** area. It can also be used to forward power and cadence to another device (see below).

- Path to `AntInterface.exe` - it is started automatically when training starts, if a path is available. The setup installs the file automatically; as long as it is present, the field shows this path and is locked (no Browse button, an entry would be ignored anyway), see *Requirement for ANT+*. Only if it is missing can a different path be entered here by hand. Applies to all users on this PC.

The actual device pairing (which ANT+ or BLE trainer, fixed device number or address, connection test) is no longer here - that is now part of the **Devices** area.

Forward power/cadence

Additionally sends the training data as its own ANT+ sensor to another device, e.g. a Garmin watch.

- Checkbox **Enable ANT+** - applies only to the currently logged-in user.
- Device ID used for communication - applies to all users on this PC.

System

General program settings.

- **Check for a new version at program start** (applies only to the logged-in user, enabled by default): ErControl checks in the background when the home page opens whether a newer version exists and then points it out on the home page, see *Notice about a new version*. The check happens once per program start; if the computer is offline, it stays silent.
- **Login automatically**: signs you in immediately at program start with the most recently used user, without clicking "Log in" in the start window. With "Sign in again" from within the running app, the automatic login is suppressed so you can actually pick another user there. Applies to this Windows user account.
- Set the log level and serial logging, open the log directory directly (applies to this Windows user account).

Units

Here you set the units in which ErControl displays and asks for distances, speeds, elevations and body weight. The values apply only to the logged-in user.

- **System of measurement**: **Metric (km, km/h, m, kg)** or **Imperial (mi, mph, ft, lb)**. The preset comes from the measurement system of the Windows region (Control Panel, Region), not from the language of the interface: even with an English interface it stays metric if Windows is set to metric (for example in Australia or Canada).
- **Individual units**: By default they follow the system of measurement (**Wie Maßsystem** / like system of measurement), but each can be set differently:
  - **Distance and speed**: kilometers (km, km/h) or miles (mi, mph).

- **Elevation**: meters (m) or feet (ft).
- **Body weight**: kilograms (kg), pounds (lb) or stones and pounds (st, lb), for example for the UK.

The units apply in the *Training Overview* including the detail area, in the *Training Detail*, in the profile view (*Profiles*), in the *Training window* and in chart axes and tooltips. Input fields convert as well: the weight in the *Users* page and when creating the first user, the start distance when starting a topographic profile, and the **maximum speed** of the gear shifting. With stones and pounds you enter the weight, for example, as `12 st 3.5 lb` or just `12 3.5`. Watts, cadence, heart rate, calories (kcal) and the gradient in percent stay unchanged.

> **Note**
>
> The setting only changes display and input. The database, the profiles, all exports (TCX, FIT, GPX, HRM, CSV) and the upload to Strava always stay metric. The physics of the route simulation uses whole kilograms internally.

Strava

Here you set up the upload of your trainings to Strava. The values only apply to the logged-in ErControl user: each user connects with their own Strava account. Strava is switched off by default; as long as **Use Strava** is not ticked, ErControl shows no Strava buttons and no Strava column in the *Training Overview* and the *Training Detail*.

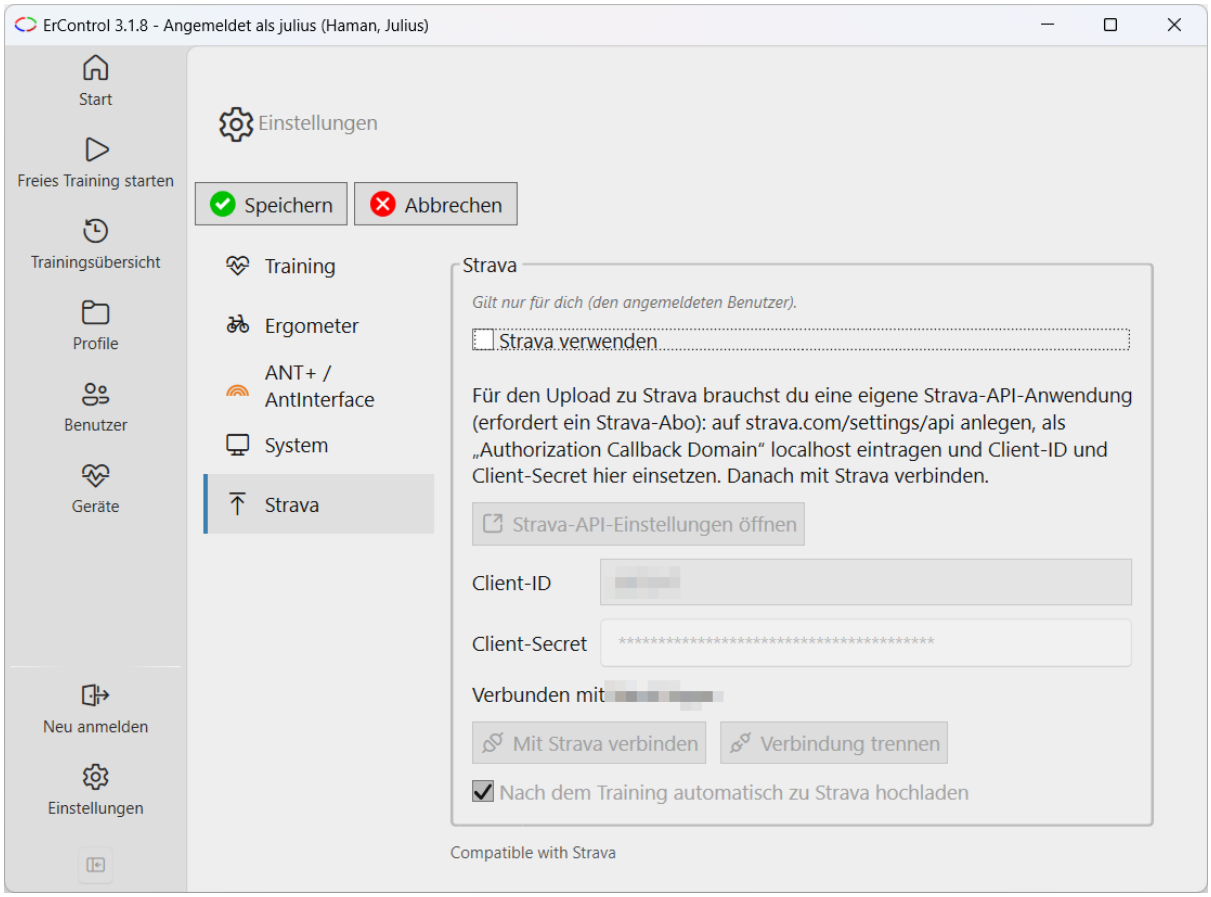


Fig. 19: Settings, **Strava** main item.

Set-up:

1. Tick **Use Strava**.
2. Create your own Strava API application (requires a Strava subscription): the **Open Strava API settings** button takes you to strava.com/settings/api. Enter `localhost` as the "Authorization Callback Domain".
3. Enter the application's **Client ID** and **Client Secret** here.
4. Click **Connect with Strava**. ErControl opens the browser, where you authorize uploading activities. Until then the status reads "Waiting for authorization in the browser …"; **Cancel** aborts this. Afterwards it reads "Connected with" and your name. **Connect with Strava** only saves the Strava credentials (client ID, client secret and the connection); other unsaved changes on the page are left alone and still need **Save**.

Disconnect ends the connection again. ErControl stores the client secret and login data encrypted and bound to the Windows account in the user settings; they cannot be used on another PC or under another Windows account - there you have to connect again.

- **Upload to Strava automatically after training**: uploads a training without asking after it has been saved. Only selectable while the connection exists. If the upload fails, the training is saved anyway and a message gives the reason; you can then upload it manually, see *Strava*.

As required by Strava, the section also shows the note "Compatible with Strava".

2.11 Keyboard shortcuts during training

During an active training session (Free Training, heart-rate/power profile, or topographic profile), individual functions can be controlled via the numeric keypad (Numpad). The keys work window-wide, regardless of which control currently has focus (e.g. even while the simulator slider is focused). Which keys currently apply in the running training is shown by the help (**F1** or the question mark button).

Always available

Key	Effect
Numpad 0	Turn gear shifting on/off. Has no effect with a heart-rate or power profile, since the profile already dictates power there.
Numpad +	With gear shifting active: shift up one gear. Otherwise, if **Power control via PC only** is enabled: increase power by one step (default 5 watts).
Numpad -	With gear shifting active: shift down one gear, also below gear 1 (0, -1, …), as long as that gear's power isn't already at the minimum of the connected training device. Otherwise, if **Power control via PC only** is enabled: decrease power by one step (default 5 watts).
Numpad 9	Turn automatic gear shifting on/off. Only with a loaded profile (heart-rate, power, or topographic profile); has no effect in Free Training without a profile.
Numpad 7	Stop - forces an immediate standstill. Mainly meant to trigger the recovery pulse measurement deliberately, in the middle of a coasting descent with gear shifting active (see *Virtual Gear Shifting*).
Numpad *	Enlarge the value bar by 5 % (up to 300 %).
Numpad /	Shrink the value bar by 5 % (down to 50 %).
Ctrl + mouse wheel	Enlarge/shrink the value bar (5 % steps), also over the 3D map.
Numpad ,	Show/hide the settings panel during training (see *Training window*).
F1	Show/hide the help with the keyboard shortcuts that apply in the current training.
Esc	Closes the open settings panel or the help.

Gear shifter and power control via PC only are configured under **Settings → Ergometer**. Numpad keys do not trigger a function while you are typing in a number field of the settings panel; **F1** and **Esc** always apply. The value bar size can also be set under **Settings → Training**.

Main Window

Key	Effect
Ctrl + B	Hide the navigation bar or pin it again, see *Main Window*.

Depending on the training type

Numpad 1-3 and 4-6 carry different functions depending on the profile type:

Key	Free Training (no profile)	Heart-rate/power profile	Topographic profile
Numpad 1	no effect	Decrease intensity	Rider camera closer
Numpad 2	no effect	Reset intensity	Reset camera distance to default
Numpad 3	no effect	Increase intensity	Rider camera further away
Numpad 4	Shrink the time window of the charts	Shrink the time window of the charts	Shrink the elevation profile's zoom window (closer in)
Numpad 5	no effect	Show the whole profile	Show/hide marker icons in the elevation profile
Numpad 6	Enlarge the time window of the charts	Enlarge the time window of the charts	Enlarge the elevation profile's zoom window (further out)

- **Intensity** (Numpad 1-3 with heart-rate/power profile): factor between 0.1 and 2 in steps of 0.05, used to scale the target curve at runtime - affects the displayed target curve and the calculated target power or target heart rate. Not saved; applies only to the current training session.
- **Camera distance** (Numpad 1-3 with topographic profile): distance of the camera to the rider in the 3D rider view, in steps of 0.5 in the range 12-16 (default 14; higher values mean a closer camera). The value is saved and corresponds to the **Abstand** (distance) slider on the map, see *Training window*.
- **Elevation profile zoom window** (Numpad 4/6 with topographic profile): visible route section in the elevation profile chart, in steps from 200 m to 50 km. The chosen step is remembered for the next training.
- **Time window of the charts** (Numpad 4/6 in free training and with heart-rate or power profiles): the visible time section of the two live charts, in steps of 2, 5, 10, 20, 30 and 60 minutes; for a profile, the overview of the whole profile is added as a further step. The charts keep running and the current training time stays in the window. With Numpad 5, both charts show the whole profile for a heart-rate or power profile, with a 5 % margin at the end so that the end of the profile is visible too. The last chosen setting is remembered for the next training, separately for free training and profiles; without a remembered setting a profile starts with the overview and free training with 20 minutes. The overview is remembered as such, not as a fixed number of minutes - so a different profile again starts with its whole length.

Note

Free Training without a profile has neither a target curve nor an elevation profile - Numpad 1-3 and 5 have no effect there, Numpad 4 and 6 zoom the time window of the charts.

2.12 Tips & Troubleshooting

How realistic is riding with ErControl?

A good question, and not one with an easy answer. The philosophy behind ErControl's development is to make riding as realistic as possible. ErControl therefore deliberately has no separate "realistic" setting.

That an average person can't ride a 200 km Tour de France stage in one go is probably obvious to everyone - and it would also spoil all the fun. That's exactly why such a mammoth profile can be tackled in several separate rides: when starting a topographic profile, you choose the start distance in the start window and pick up again where you stopped last time, see *Profiles*.

And if it's still too hard going uphill even in first gear, you can shift down further (also below gear 1) or deactivate the gear shifter and set the power yourself - see the next point for that.

Riding uphill with the gear shifter – too hard even in first gear

First, shifting down further helps: with **Numpad -** (see *Keyboard shortcuts during training*) you shift down past gear 1 to gear 0, -1, -2 and so on, as long as that gear's power is still above the minimum of the connected training device - there's no separate setting for this anymore, see *Virtual Gear Shifting*. If that doesn't help, lowering **Realitätsfaktor bei Steigung** (reality factor for gradient) or **Leistung 1. Gang bei 0 % Steigung** (power for gear 1 at 0% gradient) under *Settings* (Ergometer tab) reduces the power overall. All four gear-shifting values can also be changed directly during training in the settings panel (gear icon at the top right, see *Training window*) - restarting the training isn't necessary for that.

If that is not enough either, you can deactivate the gear shifter via **Numpad 0** and set the power yourself instead:

- Normally via the ergometer's own +/- buttons.
- If these stop responding once the ergometer has been controlled by the PC, the **PC-only power control** setting under *Settings* (Ergometer tab) helps - the Numpad +/- keys then take over power control in steps of the device's step size (default 5 watts).

Speed changes at gradient changes when riding without the gear shifter

At the points in the profile where the gradient changes, the speed is also recalculated. ErControl makes these transitions smooth: the gradient is smoothed over a 30 m window instead of jumping abruptly at profile points. On the bike ergometer, ErControl also models the inertia of the mass, so the speed gradually approaches the new gradient's value instead of adjusting abruptly. The speed therefore changes noticeably at gradient changes, but smoothly - as when riding on the road.

> **Note**
>
> This also applies with virtual gear shifting active (see *Virtual Gear Shifting*): the speed eases into the power calculated from gear and gradient. The cross-trainer, on the other hand, has no inertia - there, speed follows power directly (though the smoothing of the gradient still applies there too).

The recovery pulse measurement is wrong

This can happen if the ergometer's own recovery pulse button was pressed. Please don't press that button. With recovery pulse measurement enabled (see *Settings*, Training tab), the measurement starts automatically at the end of the training session (cadence = 0).

Speed/distance covered doesn't match the ergometer's own data

The formula the ergometer uses to calculate speed and the calculation in ErControl are not necessarily identical. An ergometer, for example, determines speed solely from cadence, whereas ErControl calculates it from the power, the rider's weight and the gradient (with an active virtual gear shifter,

from the power that results from gear and gradient, see *Virtual Gear Shifting*). Since the distance covered also follows from the speed, the two values differ accordingly.

The ANT+ heart rate strap is not found or drops out intermittently

ANT+ has no pairing: a heart rate strap simply transmits as soon as it is in operation, and any receiver in range can hear it - a pairing mode (such as Bluetooth pairing of the strap) is not necessary for this. If the strap is not found in the device selection or the heart rate drops out:

- Put on the strap and moisten the electrodes. Many straps only transmit with skin contact, and dry electrodes cause dropouts.
- Keep the distance to the ANT+ stick small and place the stick freely, for example on a USB extension cable instead of directly at the back of the computer next to other USB 3 devices.
- If the heart rate only drops out briefly, ErControl reconnects the strap automatically; the search runs without a time limit.

The Bluetooth heart rate monitor (watch) cannot be connected

If Windows already knows the device, ErControl connects immediately. Otherwise it waits up to 5 seconds before connecting for a message from the device; if it does not respond, it counts as unreachable and ErControl tries again. In the heart rate monitor list under *Devices*, a green dot shows that the device is currently announcing itself. For a watch, heart rate transmission must therefore be started; re-pairing after restarting the watch is no longer necessary. A device that is currently connected to another program usually does not transmit.

ErControl reports that no ANT+ stick was found or that the AntInterface does not match

- **No stick**: no ANT+ stick is plugged into the computer (see *The ANT+ USB stick*). Plug in the stick and start the search or the test again. When starting a training, “Continue with simulated data” remains possible.
- **AntInterface does not match the version**: ErControl compares the program version and commit identifier of the AntInterface with its own values and terminates it on a mismatch. The setup always installs both together; a clean reinstallation reliably helps, see *Requirement for ANT+*.

The serial ergometer reports “A nonexistent device was specified”

If the log shows an error opening COM4 (or another port) with the text “A nonexistent device was specified” (German Windows: „Ein nicht vorhandenes Gerät wurde angegeben“), the COM port does not (or no longer) exist in Windows. ErControl then never reaches the ergometer; the cause lies before that.

A common cause is a USB-to-serial adapter with a Prolific PL2303 chip: Windows Update installs a newer Prolific driver on its own, which no longer supports older chips and clones. Device Manager then shows a notice such as “PL2303TA DO NOT SUPPORT WINDOWS 11 OR LATER” on the adapter, and the COM port disappears. The adapter itself is not broken.

- Download the Prolific driver **3.9.0.2** (July 2021, for Windows 11) from the Prolific website and install it: in Device Manager, select the adapter, **Update driver**, **Browse my computer for drivers** and enter the folder containing the file `SER2PL_1.inf`. Then unplug the adapter and plug it in again; it appears again as “Prolific USB-to-Serial Comm Port (COMx)” without a warning icon.

- So that Windows Update does not replace the driver again, turn off driver updates in Windows Update: in a Command Prompt as administrator, run `reg add "HKLM\SOFTWARE\Policies\Microsoft\Windows\WindowsUpdate" /v ExcludeWUDriversInQualityUpdate /t REG_DWORD /d 1 /f` and restart the computer (on Windows Pro, alternatively use the policy **Do not include drivers with Windows Updates**). This applies to all devices; drivers then come only from the manufacturer. You can undo it by setting the value to `0`.
- A permanent fix is an adapter with an FTDI chip, which is not affected by this problem.

Even without a Prolific chip, it is worth checking Device Manager under **Ports (COM & LPT)**: a newly plugged-in adapter may get a different COM number, which then has to be selected again under *Devices* in the device's detail area.

The serial ergometer occasionally does not respond or the connection is re-established

If a serial ergometer fails to respond within one second once, ErControl only counts that as a missed tick: the log shows a warning such as "Keine Antwort auf „ST“ nach 1010 ms" (no answer to "ST" after 1010 ms) or "Ergometer antwortet nicht (Tick 1 in Folge …). Neuer Versuch im nächsten Takt" (ergometer not responding, retry on the next tick), and the next tick tries again. The connection is only re-established ("Verbindung zum Ergometer verloren, versuche sie neu aufzubauen", connection to the ergometer lost, trying to re-establish it) when no valid data has arrived for 5 seconds. A short dropout therefore has no consequences; an unplugged cable or a switched-off device is still detected.

If such dropouts occur frequently, these steps help narrow down the cause:

- Plug the adapter directly into the computer instead of a USB hub, and use a short cable of good quality.
- Under *Settings*, in the **System** section, switch on serial logging. The log then contains the request sent, the answer and the response time for every exchange with the ergometer. With a Kettler Racer about 40 milliseconds is normal; clearly longer times or answers that fail to arrive altogether point to the adapter, the driver or a heavily loaded system. An answer that ErControl cannot read is logged as a warning together with the command sent and the complete raw answer (at most every 30 seconds).
- The log folder can be opened directly in the same section; the log file is helpful when you report the problem.

3 Glossary

ANT+ FE-C
: ANT+ Fitness Equipment Control. A wireless protocol for fitness equipment, similar to *BLE FTMS*, but over ANT+ radio instead of Bluetooth.

ANT+ HRM
: ANT+ Heart Rate Monitor. Wireless protocol used by heart rate monitors (e.g. chest straps) to transmit heart rate via ANT+ - the heart-rate counterpart to *ANT+ FE-C*.

BLE FTMS
: Bluetooth Low Energy Fitness Machine Service. A Bluetooth standard used by fitness equipment (e.g. ergometers) to wirelessly transmit training data to a control app such as ErControl.

BLE Heart Rate Service
: Standard Bluetooth service used by heart rate monitors (e.g. chest straps) to transmit heart rate via Bluetooth Low Energy - the heart-rate counterpart to *BLE FTMS*.

Heart rate zones
: Five heart rate ranges of equal width (Recovery, Light, Medium, Hard, Maximum), 10 % of the maximum heart rate each, with colors of their own. See *Heart rate zones*.

Serial Interface
: Also called a COM port. Classic connection used by older Kettler ergometers to communicate with the PC - either via a genuine serial (RS-232) port or via a USB cable that presents itself to the PC as a virtual COM port.

Tacx FE-C over Bluetooth
: Tacx's own Bluetooth service (6E40FEC1), through which some trainers (for example the Tacx Vortex Smart) transmit the data of *ANT+ FE-C* over Bluetooth instead of ANT+ - without *BLE FTMS*. ErControl uses it automatically when a trainer does not offer FTMS; an ANT+ stick is not needed for this.

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5 Changelog

Changes to this documentation - independent of the software's own version status (18 is the current document version).

5.1 Document version 18 - 2026-10-25

Changes since ErControl 3.1.10 brought up to date (Redmine version ErControl 3.1.11):

- Settings chapter: New main item **Units** with the system of measurement (metric or imperial, preset from the Windows region) and the individual units for distance and speed, elevation and body weight (kg, lb, stones and pounds). The units apply to displays and input fields; exports and the database stay metric. With imperial units the **maximum speed** of the gear shifting appears in mph (#174).
- Users chapter: The weight is entered in the chosen unit and stored with a resolution of 0.1 kg; the sex selection now also offers **diverse** (#172, #174).
- Profiles, Training detail and Gear shifting chapters: Notes that the start distance, metrics and maximum speed appear in mi, mph and ft with imperial units (#174).
- Devices chapter: The list of COM ports is re-read every 2 seconds while the view is visible; the "not available" note disappears after the ergometer is plugged in (#175).
- Tips & Troubleshooting chapter: New section on the serial ergometer that occasionally does not respond - a single timeout no longer triggers a reconnect; also notes on serial logging (#176).
- **Model/database:** New database version 3.1.11.0 (migration `Version_3_1_11_0`): The user's body weight (`User.Weight`) now has a decimal place instead of whole kilograms; existing values are preserved. Older ErControl versions no longer open a database migrated this way (#174).
- No effect on the description: Missing English translations for sex, window title, tooltips and charts added (#171).

5.2 Document version 17 - 2026-10-18

Changes since ErControl 3.1.9 brought up to date (Redmine version ErControl 3.1.10):

- Devices chapter: Clarified that **New** always searches and a device is not created just by typing in an ID or device number. The ANT+ device number of heart rate monitor and training device is now read-only in the detail area, like the BLE address (#167).
- Chapter Main window: the **Forum** and **Send feedback** links on the start page and the extended About dialog (links to the homepage, forum, feedback and **Support via PayPal**, with icons) are described (#169).
- Chapters Users and Settings: **Save** and **Cancel** are only active while there are unsaved changes and leave the page open; in the settings all fields now go through them, and a prompt (**Save** / **Discard** / **Cancel**) appears when you switch pages, switch users, log in again or close ErControl with changes still open (#168).

5.3 Document version 16 - 2026-10-14

Changes since ErControl 3.1.8 incorporated (Redmine version ErControl 3.1.9):

- Settings chapter: new main item **Strava** (use Strava, own Strava API application with client ID and client secret, connecting via browser authorization, automatic upload after training). The main items now have an icon in front of the name (#163, #164).
- Training overview chapter: new Strava section - **Upload to Strava** button for the selected trainings, check mark column, click on the check mark and context menu **Show activity in Strava** (#163, #164).
- Training detail chapter: new Strava section with the **Upload to Strava** and **View on Strava** buttons (#163).
- Settings chapter: the name “AntPowerBridge” in the introduction is now “AntInterface”.
- **Model/database:** New database version 3.1.9.0 (migration `Version_3_1_9_0`) with the columns `StravaActivityId` and `StravaUploadedAt` on the training (nullable, empty for existing trainings) (#163).
- No effect on the description: an ANT+ FE-C trainer now follows the target power; the control commands to AntInterface previously did not arrive (#162).

5.4 Document version 15 - 2026-10-11

Additions and appearance changes without software change:

- Chapter Installation: New section “The Start Window” (login, database, skin Light/Dark and language System/Deutsch/English) and new section “Backing Up the Database and Moving It to Another PC” (location of the database file, backing up, restoring, what is not stored in the database). Chapter Main Window: reference to **Sign in again**.
- Chapter Main Window: reference to **Sign in again** (switching user or database) in the navigation bar.
- HTML help: Chapters and sections of levels 1 and 2 are numbered, as in the PDF, without a trailing period (for example “2.3 Training Overview”).
- HTML help: The footer note “Built with Sphinx using a theme provided by Read the Docs” is removed.

Changes since ErControl 3.1.7 incorporated (Redmine version ErControl 3.1.8), added to document version 15 on 2026-10-13:

- Devices chapter: presence indicator for Bluetooth heart rate monitors in the list, faster connection setup for Bluetooth devices, colored connection-type icons, a saved COM port stays visible (“not available”), skin contact detection for Bluetooth heart rate monitors, message when the ANT+ stick is missing and a check of the AntInterface version (#147, #148, #152, #157, #158, #161).
- Installation chapter: at the end, the setup starts ErControl without a waiting setup process and with the user’s rights (#160).
- Training window chapter: training points are saved at most every 5 seconds (#156).
- Tips & Troubleshooting chapter: notes on a missing ANT+ stick, a mismatching AntInterface and on connecting Bluetooth heart rate monitors.

5.5 Document version 14 - 2026-10-10

Addition without any software change:

- Installation chapter: New subsection “The ANT+ USB stick” with two photos (front and back of an ANTUSB-m) so the required stick is easy to recognise.
- New screenshots from ErControl 3.1.7: start window and “Create first user” dialog (Installation chapter), start page (Main window), Training devices and Heart rate monitors tabs as well as device selection with ANT+ and BLE (Devices chapter), free training and topographic training (Training window chapter).
- More screenshots from ErControl 3.1.7: training detail with tiles, heart rate zones, map and charts (Training detail chapter), training overview with filter bar and grouping, profiles with map and elevation profile, user management, and the Training and Ergometer tabs of the settings.

5.6 Document version 13 - 2026-10-10

Changes since ErControl 3.1.6 incorporated (Redmine version ErControl 3.1.7):

- Devices chapter: In the device search, devices that are already added for the respective role (training device or heart rate monitor) stay visible but are greyed out, marked “Already added” and cannot be selected. Matching uses the device number for ANT+ and the address for Bluetooth. The result rows are compact and single-line; text that is too long is shortened with “…” and can be read as a tooltip (#145).
- **Log:** For a Tacx trainer over Bluetooth, ErControl writes once per minute and when stopping how often the trainer reported cadence 0 or “invalid”. An aborted connection attempt to the Bluetooth heart rate monitor and a training without pulse from the heart rate monitor are logged with their duration. When reconnecting after a radio dropout, the misleading warning “Sending to the Tacx trainer failed” no longer appears (#146).

5.7 Document version 12 - 2026-10-10

Changes since ErControl 3.1.5 incorporated (Redmine version ErControl 3.1.6):

- Devices chapter: Tacx trainers with FE-C over Bluetooth (for example Vortex Smart, without FTMS) can be connected via **BLE**; the connection type is now called “BLE” instead of “BLE FTMS”, the device search shows the note “Tacx FE-C” for Tacx trainers, FTMS takes precedence. New glossary entry, Free training and Installation chapters adjusted (#144).
- Devices chapter: The devices overview no longer shows a live status and pulse for Bluetooth heart rate monitors and no longer keeps a persistent connection (#139).
- Training overview chapter: new section on filtering and grouping (period, training type, note search, grouping by month or training type, summary row) (#142).
- Tips & Troubleshooting chapter: new section on the serial ergometer that does not connect and reports “A nonexistent device was specified” - missing COM port caused by a Prolific PL2303 driver installed by Windows Update, with installation of the Prolific driver 3.9.0.2.

5.8 Document version 11 - 2026-10-08

Changes since ErControl 3.1.4 incorporated (Redmine version ErControl 3.1.5):

- Chapter Devices: ANT+ heart rate straps are found in the device selection and deliver the heart rate (#137). Description of the ANT+ search (ends after about 10 seconds without another device, at most four devices, aborted after 90 seconds at the latest) and a note on the ANT+ device number compared with the longer ID shown on the watch. ANT+ trainers (FE-C) are now decoded correctly - elapsed time, distance, speed and heart rate were previously read from the wrong data field; not verified on real hardware (#138).
- Chapter Devices: Bluetooth heart rate monitors and ergometers wait up to 5 seconds for a message from the device before connecting; re-pairing after restarting the watch is no longer necessary (#133, #134). Not verified on real hardware for ergometers.
- Chapter Devices: For serial devices, the baud rate is remembered per device and tried first on the next connection (#135).
- Chapter Installation: The file name of the migrated database replaces an existing version suffix even if it was appended with an underscore (#136).
- Chapter Tips & Troubleshooting: new sections on the ANT+ heart rate strap (not found or intermittent dropouts) and on the Bluetooth heart rate monitor (watch) (#137, #133).
- Chapter Training window: Reading from and sending to the ergometer no longer blocks the display (display clock); the remaining time in the recovery heart rate window runs without duplicated or skipped seconds (follow-up to #131).
- **Model/database:** New database version 3.1.5.0 (migration `Version_3_1_5_0`) with the column `SerialBaudRate` on the device (nullable, learned on the next connection) (#135).
- **Log:** The ergometer connection is logged with one warning line per failed attempt, “Ergometer COM4 connected (9600 baud)” and “Ergometer connection closed”; AntInterface reports channel events and errors in the log (#136, #137).

5.9 Document version 10 - 2026-10-05

Changes incorporated:

- **Training window (free training, heart-rate and power profiles):** the poll timer now runs without queue build-up (AutoReset switched off), the next tick is triggered only after the previous one has finished; as a result heart rate and the measuring clock stay stable and the recovery heart rate dialog is no longer opened from within the poll tick (#127). The display clock is decoupled from the poll cycle (#131). Measuring times of the training points are stored to the millisecond (decimal seconds); the distance is no longer interpolated to the second mark (#127).
- **Training window (topographic training):** coasting now only happens with topographic profiles; with heart-rate and power profiles the profile simply keeps running after it has ended (#132).
- **Devices & connection:** losing the ergometer connection is caught and automatically restored in the background (#129). Losing an external heart rate monitor (BLE/ANT+) is detected, displayed and automatically reconnected (#130).
- **Model/database:** the database version is now derived solely from the name of the latest EF migration (no separate hand-maintained constant any more); new migrations are named

`Version_a_b_c_d`, and version 3.1.4.0 is combined into the migration `Version_3_1_4_0`. Duplicate training points per second are cleaned up in the migration (the first point per second is kept). `Profile.IsRelative` is integrated in the same migration, `TrainingPoint.Time` is changed to NUMERIC (millisecond-accurate) (#128, #126).

- **Export:** TCX now contains speed per trackpoint and maximum speed (#123). FIT contains speed per second and maximum speed in lap/session (#122). Exports convert the millisecond-accurate measuring points to a 1 Hz grid by interpolation (#127).
- Chapter Users: new optional field **FTP** (watts) in the master data; the FTP is saved with the training when it starts (#119).
- Chapter Profiles: power profiles are available in watts or in % FTP (selection **Einheit** (unit); conversion with the user's FTP; a %-FTP profile does not start without an FTP) (#121). The import button is now a menu: **GPX-Import** and **Workout-Import** for ZWO, MRC, ERG and FIT (#120). New **Export** menu: heart-rate and power profiles as FIT workout, topographic profiles as GPX track (#124).
- Chapters Training overview and Training detail: new export **Export (FIT)**; description of the exports adapted to the millisecond-accurate measuring points and the 1 Hz grid (#122, #127).
- Chapter Training window: while coasting (cadence 0, speed still above 0), training points with cadence 0 are recorded and included in the averages (#125); note on %-FTP profiles without an FTP.

5.10 Document version 9 - 2026-10-01

Changes incorporated:

- Training detail chapter: heart rate, power, cadence and speed each have a chart of their own instead of one shared chart (for topographic trainings below the terrain profile), and charts without measured values are hidden; new sections "Average" (dashed average line, value to the right of the chart) and "Maximizing a chart" (own window per chart); the sections on the heart rate axis, scale and tooltips were adjusted (#118)
- Training overview chapter: exports (TCX, HRM, CSV) contain only one training point per second; the TCX file no longer contains a creator element and, for trainings without a topographic profile, no position (#115, #116, #117)
- Chapter Training window: for heart-rate profiles, the value bar shows the target power set by the heart-rate control (e.g. **→ 80 W**) below the power value instead of the watt unit, initially the user's starting power (#108), and the target heart rate below the actual heart rate (**→ 126 bpm**, #109); for power profiles the target power appears below the actual power (#110); in addition, the control now holds the starting power until the first adjustment instead of dropping to the still low actual power
- Chapter Training window: the chart of free training and heart-rate and power profiles is now split into two charts - heart rate on top (60 % of the height, with heart-rate zones and target curve), power (left) and cadence (own axis on the right) below (40 %), sharing one time axis (#111)
- Chapters Key combinations and Training window: the time window of the live charts (free training, heart-rate and power profiles) can be shrunk and enlarged with Numpad 4/6 in steps of 2, 5, 10, 20, 30 and 60 minutes (for a profile additionally its total length); Numpad 5 shows the whole profile with a little margin at the end for heart-rate and power profiles; the last chosen setting is remembered for the next training (profiles start with the overview by default) (#112)

- Chapter Training window: after the end of a heart-rate or power profile, the target value displays in the value bar disappear, and in simulation mode the power slider is enabled again (#114)
- Chapter Profiles: points editor revised - new rows sit 5 minutes after the previous row and take over its value, Tab in the last cell inserts a row, the selected row is highlighted in the chart (and a click in the chart selects the nearest point), profile tree and toolbar are locked until saved; profiles and folders can be moved by drag and drop, also several at once (#106)
- Chapter Training window: heart-rate and power profiles start with the whole profile in the chart instead of the 20-minute window of free training (#107)
- Chapter Profiles: the value axis of the profile preview always extends from 0 to at least 100 % of the maximum heart rate for heart-rate profiles, and from 0 to at least 200 W for power profiles (#106)
- Chapter Profiles: note that heart-rate profiles should have segments of at least about 5 minutes, because heart rate follows a power change only with a delay

5.11 Document version 8 - 2026-09-28

Changes since ErControl 3.1.1 incorporated:

- Chapter Installation: The file name of the migrated database replaces an existing version suffix even if it was appended with an underscore (#136).
- Chapters Devices and Settings: section on AntInterface adjusted accordingly - the path is now determined automatically, the field is locked as long as the bundled file is present
- Chapter Training detail: new section “Load and focus” below the heart rate zone legend, calculated as Edwards TRIMP resp. by rules from the zone time shares (#77; as columns of the training overview #78); new section “Heart rate axis” - the heart rate now has an axis of its own in the chart, from zone 1 to zone 5 (#92); Export button (TCX/HRM/CSV) in the header; “Continue profile” now first opens the start window with the end position as the pre-filled, still changeable start distance instead of starting directly (#82)
- Chapter Training overview: Export is now a single menu (TCX/HRM/CSV, separated CSV all) instead of individual buttons; Export and Delete now act on several selected trainings, with a progress dialog from 2 seconds on, while Continue/Power profile/Details are only available while exactly one training is selected (#86); new selectable columns Load and Focus (#78)
- Chapter Profiles: the start window for topographic profiles now also opens when continuing a training, with its end position as the pre-filled start distance (#82)
- Chapter Users: field order on the card corrected - first name now comes before last name (also in the new first-user dialog)
- Chapter Training Detail: new speed chart for all training types below the existing charts, X axis coupled with them (zooming, panning, aiming together), own tooltip with only time, distance and speed (#96)
- Chapter “Gear Shifters” renamed to “Virtual Gear Shifting” and completely reworked: no more dedicated management page and no more named gear shifters, instead a directly configured power per gear (base power, step, reality factor for gradient, maximum speed) under Settings → Ergometer or in the training’s settings panel; the usable number of gears is no longer fixed but results from the power range of the connected training device at the current gradient, power increases are ramped gently, the value bar shows the target power (#99)

- Chapters Settings, Training Window, Keyboard Shortcuts during Training and Tips & Troubleshooting adjusted accordingly for the new gear shifting
- Training window chapter: new average values on the right of the value bar (speed, heart rate, power, cadence, #104), which can be shown or hidden with the new **Show average values** setting (Settings chapter and the settings panel during training); order heart rate, power, cadence, header “Distance” instead of “ridden”, speed in the chart’s purple
- Units unified: W instead of watt, rpm instead of 1/min, bpm for heart rate - in the value bar, charts, tooltips, training detail, training overview and settings windows (#102)
- Time display is compact as m:ss, and only from one hour on as h:mm:ss (value bar, duration tile, training overview with a right-aligned column, profile view and chart tooltips, #102)
- Training window and Virtual Gear Shifting chapters: at the end of a profile the speed stops immediately when cadence is 0 instead of coasting on; the coasting indicator only appears while actually coasting (#103)

5.12 Document version 7 - 2026-09-24

Changes since ErControl 3.1.0 incorporated:

- New chapter “Training Detail” (#65): a detail page of its own for each training with paging, tiles, heart rate zone pie chart, route map, terrain profile and a heart rate/power/cadence chart with switchable X scale (per km / per time), aiming with tooltips (#71) and “Continue profile”; also the ID of the training behind the paging buttons (#76) and a “Note” field at the very bottom that is saved automatically and carried over into the TCX export (#75)
- Users chapter: five heart rate zones with their colors, resting heart rate and historization of maximum and resting heart rate per training (#66); heart rate zone bar and bands in the training window, profiles and training overview
- Training Overview chapter: double-click opens the training detail page, calories instead of energy (kcal only, #67), “Continue” also for topographic trainings that have not been ridden to the end, TCX export with sport, creator, average/maximum heart rate and maximum/resting heart rate notes (#68, #70); the internal number of the training as a fixed first column “ID” (#76), “Note” as a selectable column (#75), “Continue” for topographic trainings only from 100 m of remaining profile length, the training viewed last is highlighted and focused after returning from the detail page
- Training Window and Profiles chapters: tooltips with the time as hh:mm:ss and the measured value with its unit (#71), calories in the value bar
- New chapter “Main Window”: home page with a notice about new versions (#74; Settings chapter: the version check is now implemented and enabled by default), hiding the navigation bar and showing it with the mouse at the left edge (#72); keyboard shortcuts: Ctrl + B
- Glossary: heart rate zones

5.13 Document version 6 - 2026-09-20

Changes since ErControl 3.0.5 incorporated:

- New chapter “Training window”: value bar (scaling via Numpad *, / and Ctrl + mouse wheel or in the settings, #56; distances with two decimal places, #54), simulator sliders in the value bar (#57), settings panel during training (gear icon, #58), help listing the active keyboard shortcuts (F1, #59)

- Topographic training: new 3D training window with rider view, bird's-eye view, profile zoom view and movable splitters (#51); recording freezes at the finish, the distance counts from 0 (#47)
- Profiles chapter: 3D map with base maps and tilt, aiming in the elevation profile, rider view, "Play profile" (#51), start window with start distance (#47), adjusted elevation axis (#55)
- Training overview: stages and the "Finished" and "Stage" columns are gone, "Continue" no longer applies to topographic trainings (#47)
- Keyboard shortcuts: with topographic profiles, Numpad 1-3 control the camera distance of the rider view; new: Numpad *, Numpad /, Ctrl + mouse wheel, Numpad , (settings panel), F1 (help) and Esc
- Settings: value bar scaling (Training tab) added
- Gear shifters: switching the gear shifter during a running training
- Tips: note on stages replaced by the start distance
- Profiles chapter: gradient colors as an average over zoom-dependent sections (#60), new section "Operating the chart" covering zooming and panning only along the distance or time axis (#61), and a tooltip on click showing kilometers, elevation and gradient or time as mm:ss (#62); training overview and training window updated accordingly
- Devices chapter: new section "Power range" - minimum, maximum and step size now belong to the training device instead of the settings (#42); for serial and ANT+ FE-C they are entered by hand because ErControl cannot query a range from these devices (#41), BLE FTMS reports it itself. Settings → Ergometer: "Maximum power" is removed; training window, keyboard shortcuts and tips adjusted to the device's step size

5.14 Document version 5 - 2026-09-17

- Gear shifters chapter expanded with negative gears (#50, easy gears below gear 1) as well as the inertia model and downhill coasting (#36, #39)
- Settings → Ergometer: new values for the count and reduction of the negative gears documented (#50)
- Keyboard shortcuts: new "Stop" key (Numpad 7, #39) added, the Numpad– row expanded to cover negative gears
- Training overview adjusted for the switch to pure training data (#49): topographic training sessions now show only the ridden route without the remaining-route/label display, heart-rate profiles show the target curve that applied at the time of recording, power profiles no longer show a target curve
- Export action updated from "Export (Strava gpx)" to "Export (TCX)" (#45)
- Profiles chapter expanded with the gradient coloring of the elevation profile (#32)
- Devices chapter expanded with the automatic reading of the power range for BLE FTMS devices (#40)

5.15 Document version 4 - 2026-09-14

- Devices chapter adjusted for ticket #29: Save/Cancel removed (auto-save), “first device found” wildcard option removed, new Device selection and Connection test sections, ANT+ HRM timeout corrected from 12s to 30s
- Auto-login option added (Settings → System)
- Unified “Connect to device…” dialog documented (now also runs for the heart rate monitor in parallel with the training device)
- Corrected a stale reference to the removed “first device found” option in the ANT+ settings
- Protocol/COM icons added to the device list (#27)

5.16 Document version 3 - 2026-09-09

- Reference tables for the standard gear shifters and the “Tips & troubleshooting” chapter carried over from the 2.x manual
- Practical values for rolling resistance (cr) and drag (cw·A) added
- PDF: each chapter now starts on a new page
- Inertia formula in the free training chapter corrected (energy balance)
- Added the changelog page (this page)

5.17 Document version 2 - 2026-09-08

- New chapters: gear shifters, users, profiles, training overview
- All new chapters also available in English

5.18 Document version 1 - 2026-09-07

- First version of the documentation: Sphinx toolchain (HTML + PDF), installation, program documentation, settings, devices and glossary chapters
- English translation of the documentation introduced (sphinx-intl)

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