THE SV PROFILER

SOUND VELOCITY PROFILES · CTD · USR

User Manual

CTD and SV probe profiles, USBL exports
and instrument calibration checks

Version 1.2

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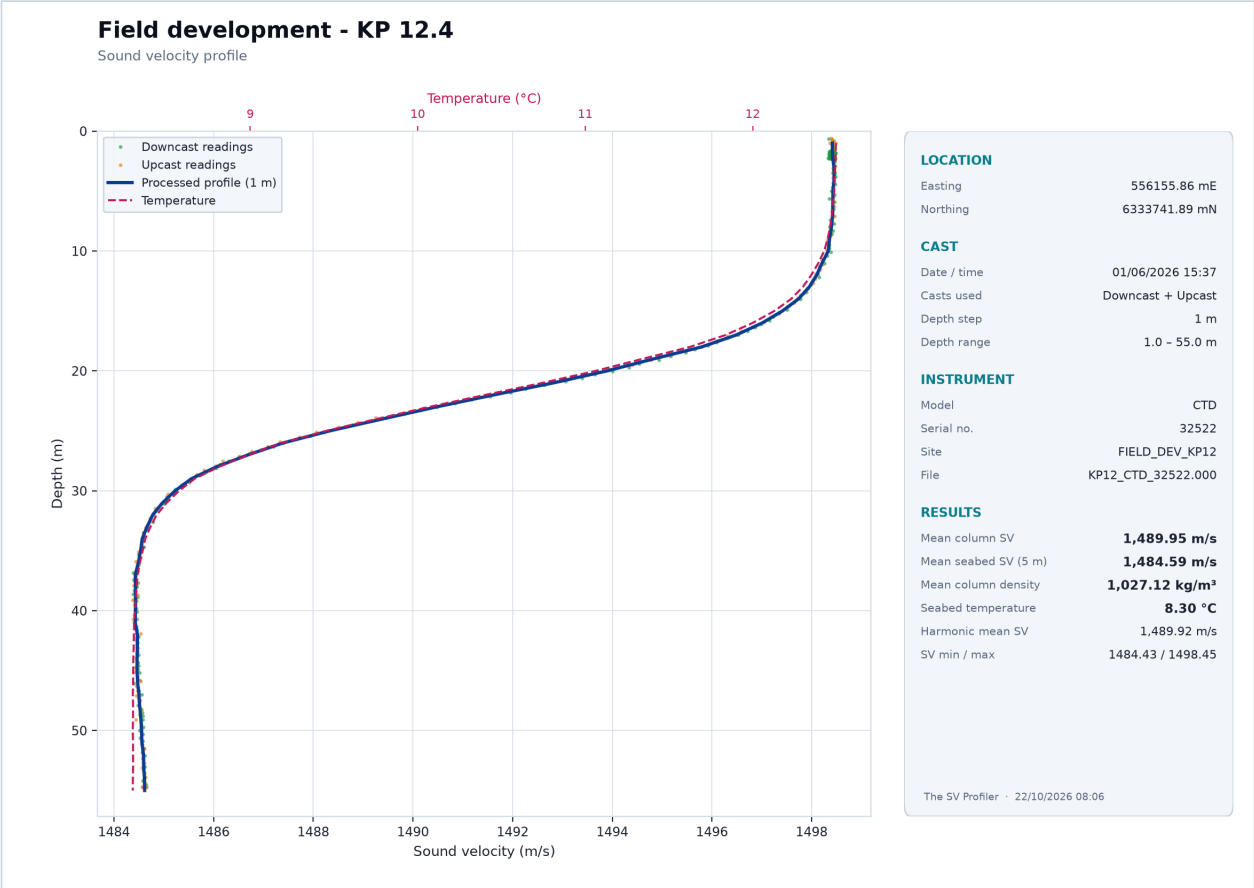
1 Introduction

The SV Profiler processes sound velocity profiles from a CTD, an SV probe or similar instrument, or from any text file with depth and sound velocity columns. It:

- reads the data file and its header (instrument model, serial number, site and time);
- finds the downcast and upcast for you, leaving out readings taken in air or before and after the cast;
- uses the downcast, the upcast or both, averaged into depth steps;
- works out the mean column SV, mean seabed SV, mean column density and seabed temperature;
- draws the profile with the project name, location, instrument details and results, and exports it as a PNG image or PDF;
- exports the profile as a .usr file ready to load, and as CSV;
- compares two profiles, for example the downcast against the upcast, or today's cast against yesterday's; and
- checks two instruments against each other, with PASS / FAIL results against your tolerances, as a calibration check.



A processed profile as exported. Every graph in this manual was made by the program, from example data.

2 Getting started

2.1 What you need

- A Windows PC.
- The program file, **SVProfiler.exe**. Nothing else needs to be installed.
- The data files from your sound velocity instrument, copied to the PC.

2.2 Installing

Copy **SVProfiler.exe** into a folder of your choice, for example a folder in Documents or on the desktop. There is no installer.

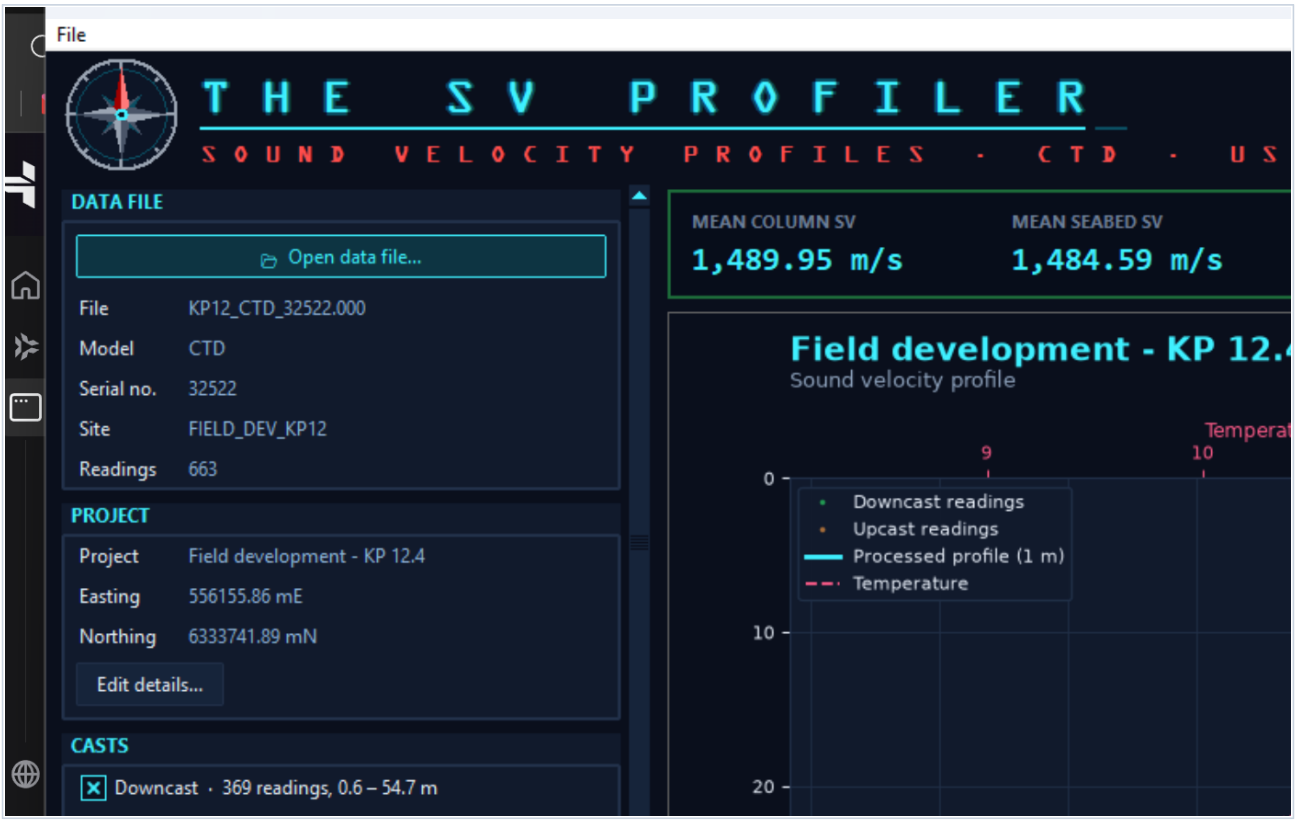
> **Tip**
> For quick access, right-click SVProfiler.exe and choose **Send to > Desktop (create shortcut)**, or pin it to the Start menu or taskbar.

2.3 Starting the program

Double-click **SVProfiler.exe**. You can also drag a data file onto the program's icon (or use **Open with**) to start with that file already open.

> **Note**
> The first time you start the program, Windows may show a **Windows protected your PC** message. Click **More info**, then **Run anyway**.

3 The main window



The main window with a CTD cast processed: the controls on the left, the result tiles and the profile on the right.

- **Title banner** across the top, with the licence bar under it during the trial.
- **File menu** with every command and its keyboard shortcut (see the appendix).
- **Control panel** down the left: the data file, project details, casts, comparison, processing settings, columns, graph options and exports. Scroll it with the mouse wheel if it doesn't all fit.
- **Result tiles** across the top: mean column SV, mean seabed SV, mean column density, seabed temperature and the maximum depth (or, when comparing, the difference between the two profiles).
- **The graph**, which updates straight away whenever you change a setting.

4 Processing a profile

In short:

1. Click **Open data file** (Ctrl+O) and choose the file.
2. Type the project name, easting and northing when asked.
3. Check the downcast and upcast it has found, and tick the one(s) to use.
4. Check the depth step and the other settings, and look over the graph and results.
5. Export the graph and the .usr file.

4.1 Opening a data file

The program reads CTD and SV probe files (such as .000 files) and most other text files laid out in columns, separated by tabs, commas, semicolons or spaces. It finds where the numbers start, reads the column names from the line above them, and reads any header lines above that, such as:

```
Model Name :        CTD
Site Information :  FIELD_DEV_KP12
Serial No. :        32522
```

The model, serial number and site are shown in the DATA FILE section and on the graph, with the file name and the number of readings.

4.2 Project details

The project details, asked for as soon as a file is opened.

Detail	Notes
Project name	The graph's title. The site name from the file is suggested.
Easting	The profile's location, shown exactly as typed (for example 556155.86 mE).
Northing	As above (for example 6333741.89 mN).
Comment	Optional, shown in italics under the results.

The details from the last profile are offered again, so for a series of casts you only change what is different. Change them at any time with **Edit details** (Ctrl+D).

4.3 Casts

The program finds the cast for you. A reading counts as **in the water** when:

- it is deeper than the surface threshold (0.5 m unless you change it);
- its conductivity, if the file has it, is above 1 mS/cm, so readings in air are left out;
- its sound velocity is between 1350 and 1700 m/s.

The cast is the run of in-water readings around the deepest reading. A gap of more than 5 minutes between readings ends it, so readings taken before or after the cast are left out. Everything down to the deepest reading is the downcast, everything after it the upcast.

The CASTS section shows each one, for example **Downcast · 369 readings, 0.6 – 54.7 m**. Tick one or both; with both ticked, all their readings are averaged together.

4.4 Processing settings

Setting	Default	What it does
Depth step (m)	1	Readings are averaged into steps of this depth (0.1 to 10 m), or choose **Every reading** to use each reading as it is. A step with no readings is filled in from the steps either side.
Surface threshold (m)	0.5	Readings shallower than this are left out (section 4.3).

Setting	Default	What it does
Seabed layer (m)	5	The bottom part of the profile used for the mean seabed SV and the seabed temperature.
Extend to depth (m)	blank	Adds a point at this depth with the deepest value, for when the profile must reach deeper than the cast. Leave blank for none.
Extend to the surface	off	Adds a point at 0 m with the shallowest value.

Extended points are drawn as open circles on the graph. They are included in the .usr and CSV exports but not in the results.

4.5 Columns

The depth, sound velocity, temperature, salinity, conductivity and density columns are found from the column names. If an instrument names them differently, choose the right column in the COLUMNS section. Only depth and sound velocity are essential; the others add the density and temperature results.

- Pressure in metres (as many probe files give it) is used as depth. Pressure in dbar or bar is turned into metres using the density and gravity from the file's header, or typical sea water values.
- A density anomaly (such as 26.21) is turned into a full density (1026.21 kg/m^3).
- If there is no density column but there are temperature and salinity, density is worked out with the UNESCO EOS-80 equation of state.

4.6 Graph options

- **Show individual readings**: the downcast (green) and upcast (orange) readings as dots behind the processed profile.
- **Show temperature**: the temperature profile as a dashed line, with its own scale across the top.

5 Results

Result	How it is worked out
Mean column SV	The depth-weighted average sound velocity from the top to the bottom of the profile.
Mean seabed SV	The average sound velocity in the seabed layer (the bottom 5 m unless you change it).
Mean column density	The depth-weighted average density (kg/m^3) over the profile.
Seabed temperature	The average temperature in the seabed layer.
Harmonic mean SV	The depth-weighted harmonic mean (shown on the graph): the average speed of a sound pulse travelling straight down the column.
SV min / max	The lowest and highest sound velocity in the profile.

The first four are shown in the tiles above the graph, and all of them in the graph's information panel.

6 Exports

Use the EXPORT section or the File menu. Each export offers a file name based on the date of the cast.

6.1 Graph (PNG or PDF)

Export graph as PNG (Ctrl+E) and **Export graph as PDF** (Ctrl+P) save the graph as an A4 landscape page with a white background for printing, showing the project, location, cast, instrument and results. Comparisons and instrument checks are exported the same way.

6.2 The .usr file

Export .usr profile (Ctrl+U) saves the processed profile in the .usr layout USBL systems accept: the cast date and time on the first line, then one line per depth with the depth and sound velocity separated by a tab:

```
01/06/26 15:37
1.00    1498.42
2.00    1498.42
3.00    1498.45
4.00    1498.45
5.00    1498.43
...
```

- The time is the start of the casts used, as dd/mm/yy hh:mm.
- Depths and velocities have two decimal places, from the shallowest depth to the deepest.
- The file name is offered as the cast date, for example **01062026.usr**.
- .usr profiles are normally at 1 m steps; you are asked to confirm if the depth step is anything else.

6.3 CSV

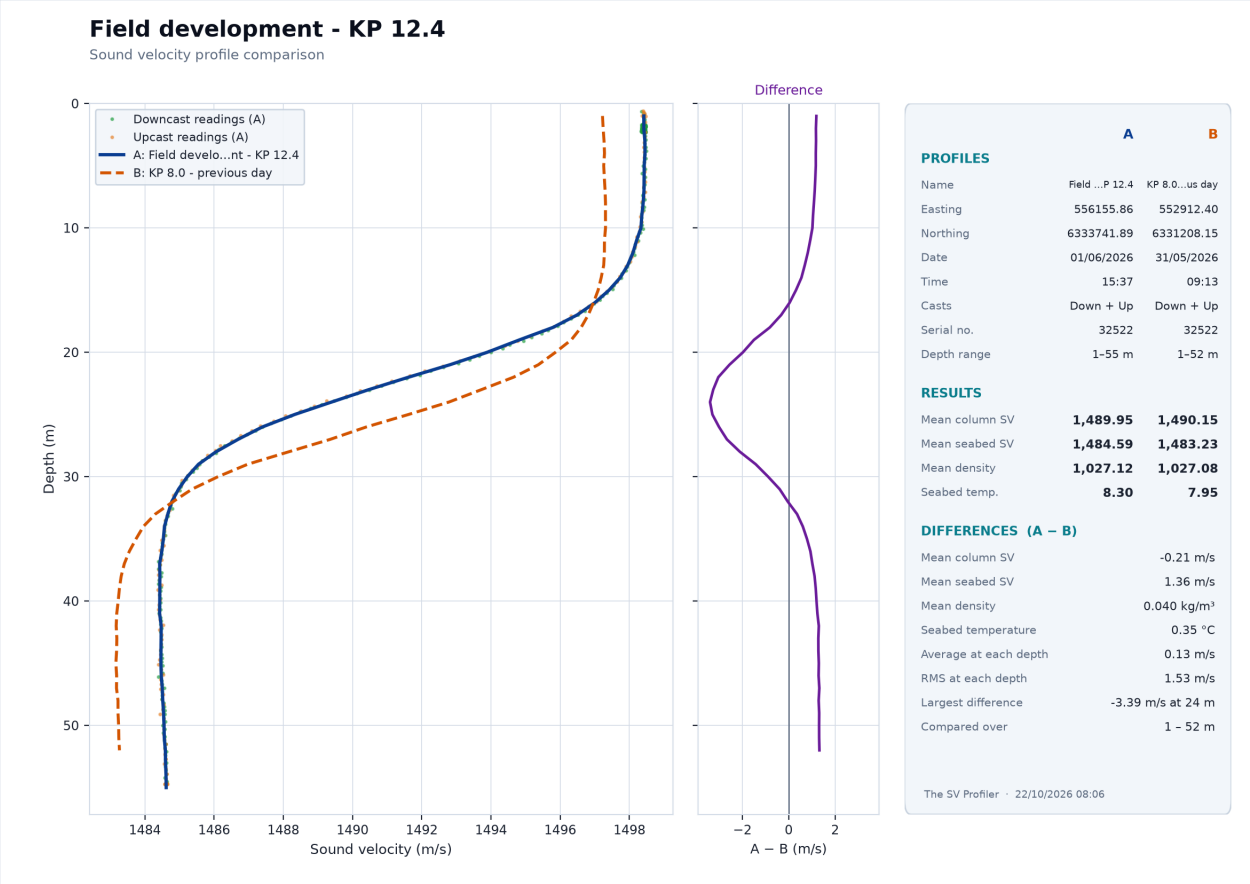
Export CSV saves every depth of the processed profile with sound velocity, temperature, salinity and density, each marked as measured, interpolated (a filled-in step) or extended. It opens in Excel.

7 Comparing two profiles

Load a second profile (B) to compare with the main one (A): for example the downcast against the upcast, a new cast against the previous one, or a new cast against the .usr profile already loaded in the USBL system.

1. Open the main profile (A) as usual.
2. In COMPARE WITH (PROFILE B), click **Load comparison profile** (Ctrl+B), choose the file and enter its name, easting and northing.
3. Tick B's downcast and / or upcast. B uses the same processing settings as A.
4. Leave **Compare as** on **Profiles (by depth)**.

The graph shows A as a solid line and B dashed, a plot of the difference A – B against depth, and a side-by-side panel of both profiles' details and results with the differences between them: mean column SV, seabed SV, density and seabed temperature, the average and RMS difference at each depth, and the largest difference and its depth. The fifth tile shows the mean SV difference.

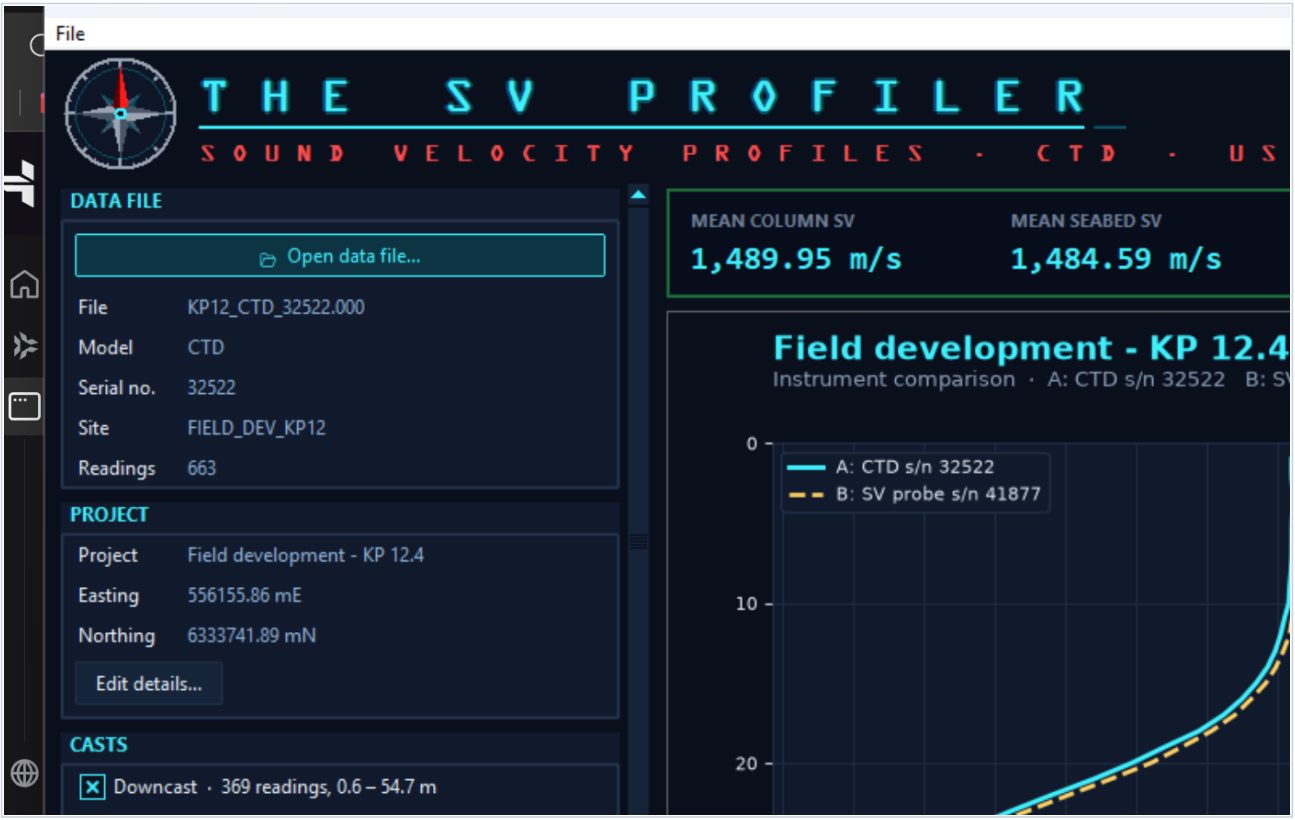


Today's cast at KP 12.4 (A) compared with the previous day's cast at KP 8.0 (B), as exported.

- **Swap A ■ B** makes B the main profile. Exports of .usr and CSV are always of profile A, so use Swap to export B.
- **B details** changes B's name and location; **Clear** goes back to a single profile.
- Profile B can be any file the program reads, including a .usr file.

8 Instrument calibration check

To check that two instruments agree (and so that their calibrations are good), record a profile with each, load one as A and the other as B, and set **Compare as** to **Instruments (calibration check)**.



A CTD (A) checked against an SV probe (B) fixed to the same frame, matched by time.

8.1 Settings

Setting	Default	What it does
Match readings by	Depth	**Depth**: for two instruments cast one after the other at the same place; B's profile is read at each of A's depths. **Time**: for two instruments fixed together on one frame; each A reading is paired with the B reading closest in time. Matching by time also compares depth, which checks the pressure sensors.
Time window (s)	2	How close in time two readings must be to pair up.
B clock offset (s)	0	Added to B's times, to correct for the two instruments' clocks not being set exactly the same.
Tolerances (±)		Sound velocity 0.5 m/s, temperature 0.05 °C, salinity 0.1 PSU, depth 0.5 m. Set them to your specification.

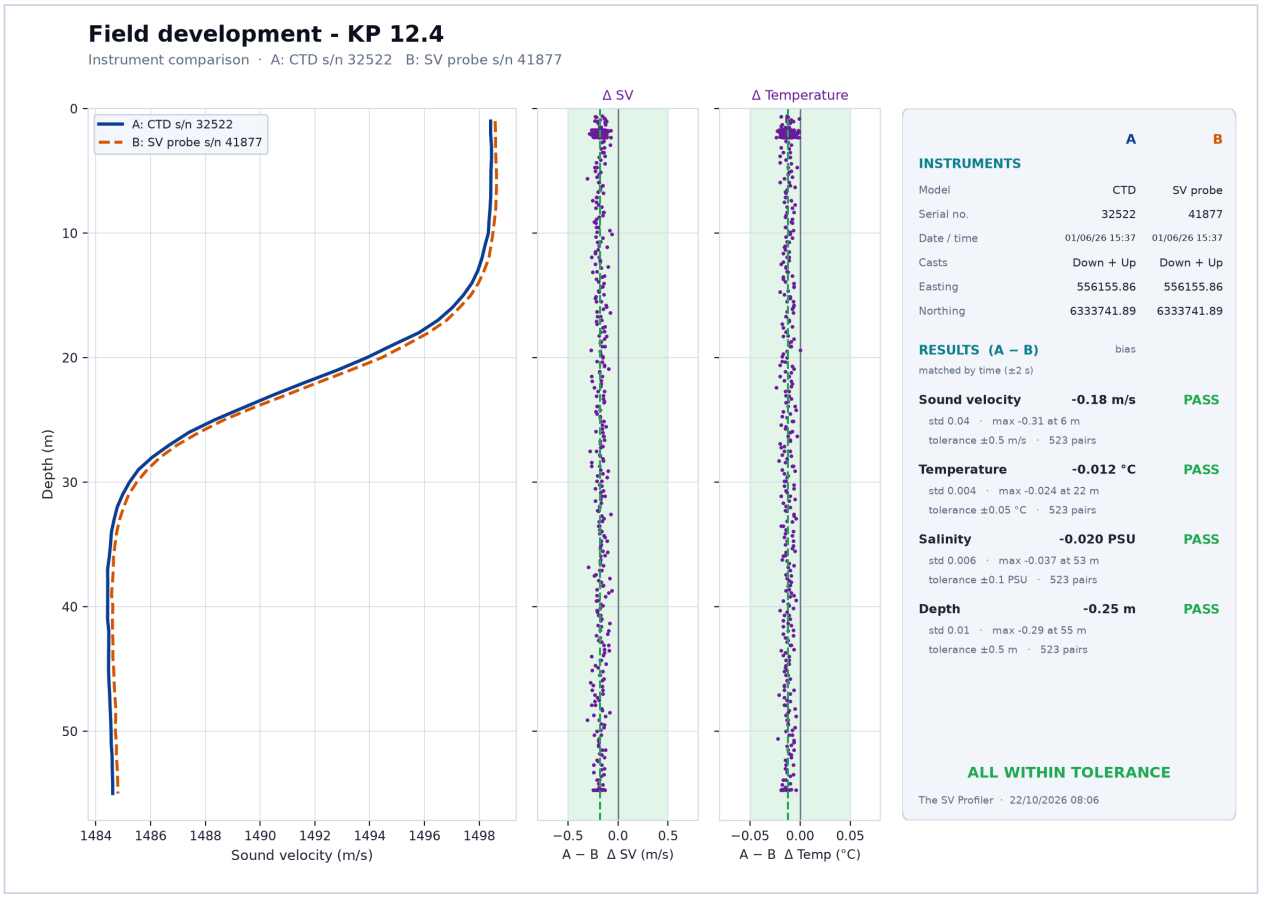
8.2 Results

For each value both instruments record (sound velocity, temperature, salinity and, when matching by time, depth), the check shows:

Result	Meaning
Bias	The mean difference A – B: how far apart the instruments read on average.
Std	The standard deviation of the differences: how much they scatter.
Max	The largest single difference and the depth where it occurred.
Pairs	How many readings were compared.
PASS / FAIL	PASS when the size of the bias is within the tolerance.

The panel ends with **ALL WITHIN TOLERANCE** or **OUTSIDE TOLERANCE**, and the fifth tile shows the SV bias with PASS or FAIL. The graph shows both SV profiles, and the SV and temperature differences against depth with the

tolerance shaded green and the bias as a dashed line.



The instrument check as exported. Here the SV probe's pressure sensor sat 0.25 m below the CTD's, which shows as a steady depth bias.

8.3 Check CSV

Export check CSV saves every matched pair of readings with both instruments' values and the differences, for your records or further analysis.

8.4 Good practice

- Mount the instruments as close together as possible, with their sensors at the same height, and match by time.
- Let both instruments settle in the water for a few minutes before the cast.
- If the time match finds few or no pairs, the clocks are probably set differently: compare the times in the two files and enter the difference as the B clock offset.
- When matching by time, a steady depth bias is often just the vertical distance between the two pressure sensors on the frame.
- Export the check as PDF to keep with the instruments' calibration records.

9 Trial and licence

The program runs as a free 48-hour trial with everything working. The bar under the title shows how long is left:

The trial bar.

After that it needs a Survey Software Utilities licence key: click **Enter licence key…**, paste the key from the email and click **Activate**. One key unlocks every Survey Software Utilities program on the PC, on up to 4 PCs. With a licence the bar goes, and the window title shows **Licensed until** and the date. The licence is checked online now and then and works for up to 30 days at a time without internet.

10 Troubleshooting

Problem	What to check
“Couldn't find any columns of numbers”	The file isn't a column data file, or uses an unusual layout. Check it opens as text in Notepad.
Asked to choose the depth and sound velocity columns	The column names weren't recognised. Choose them in the COLUMNS section.
Downcast or upcast “none found”	The data never goes deeper than the surface threshold, or the sound velocity or conductivity column is wrong. Check COLUMNS and lower the surface threshold.
The profile includes readings from on deck	The conductivity column isn't selected, so readings in air can't be recognised. Select it in COLUMNS.
Gaps or straight lines in the profile	Some depth steps had no readings and were filled in. Use a larger depth step or both casts.
The graph export fails	The file may be open in another program (for example a PDF reader). Close it, or save under a different name.
The instrument check finds no pairs	When matching by time, the clocks differ by more than the time window: set the B clock offset. When matching by depth, the two profiles must cover the same depths.
Density shows —	The file has no density column, and no temperature and salinity to work it out from.

Appendix: quick reference

Keyboard shortcuts

Keys	Command	Keys	Command
Ctrl+O	Open data file	Ctrl+E	Export graph as PNG
Ctrl+D	Project details	Ctrl+P	Export graph as PDF
Ctrl+B	Load comparison profile (B)	Ctrl+U	Export .usr profile

Files the program reads

.000 probe files and most column text files (.txt, .csv, .dat, .asc, .vp2, .svp, .usr), with columns separated by tabs, commas, semicolons or spaces, with or without a header. Times in the first column (for example 01/06/2026 15:39:16) are read and used to find the cast, for the cast time and for time matching.