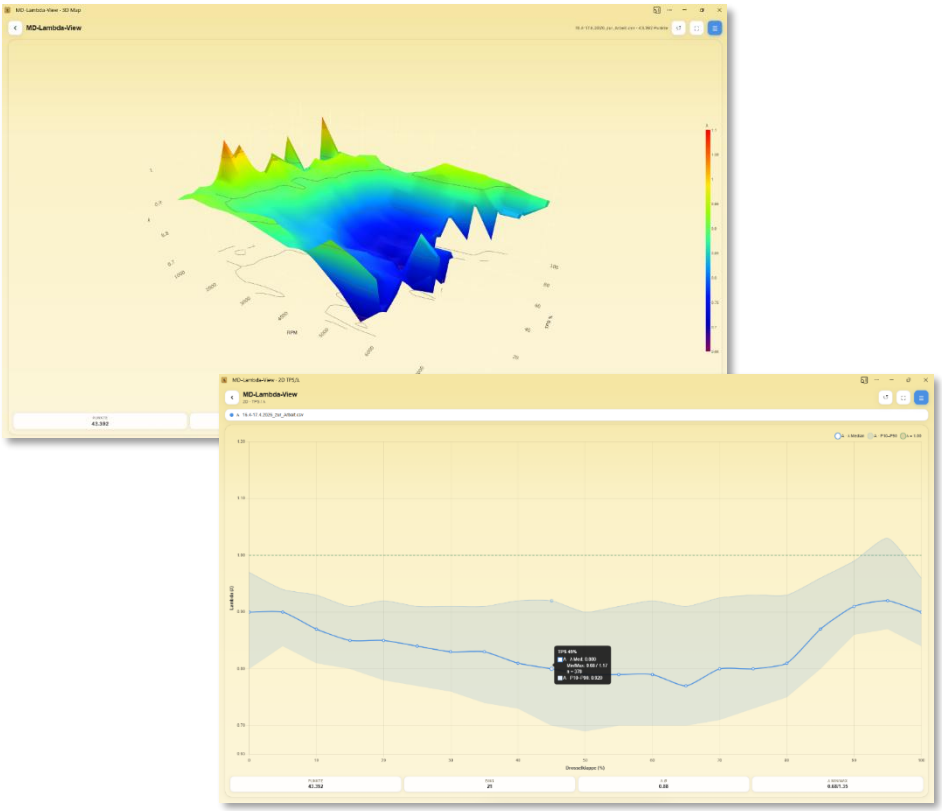
# User Manual

"Analysis Software"

English

**V 1.0**



MD-Lambda-View UG (haftungsbeschränkt)
Managing Director: Mario Deuse
Taubenbrunnen 13
37120 Bovenden
Tel.: +49 (0) 171 7563470

VAT: 20/200/42392
HRB: 207837
Registered office: Bovenden
Register court: AG Göttingen
WEEE: DE 52254643


info@md-lambda-view.com
www.md-lambda-view.com

# Content




MD-Lambda-View UG (haftungsbeschränkt)
Managing Director: Mario Deuse
Taubenbrunnen 13
37120 Bovenden
Tel.: +49 (0) 171 7563470

VAT: 20/200/42392
HRB: 207837
Registered office: Bovenden
Register court: AG Göttingen
WEEE: DE 52254643




info@md-lambda-view.com
www.md-lambda-view.com

## 1. Purpose of the Application

The MD-Lambda-View Analysis Software is used for graphical evaluation of CSV measurement data recorded with the MD-Lambda-View data logger. The application visualises the relationship between engine speed, throttle position and lambda value in two complementary views.
The app contains two analyses:

- **2D Analysis TPS · λ:** Lambda median against throttle position, including a scatter band. Ideal for carburetor tuning.
- **3D Map RPM · TPS · λ:** Three-dimensional map, comparable with an injection map. Suitable for analysing load and engine-speed ranges.

The application allows you to:

- Analyse complete load ranges
- Detect lean or rich zones
- Evaluate part-load, transition and full-load ranges
- Smooth data through binning and aggregation
- Directly compare two log files (before/after)

## 2. System Requirements

- Modern web browser (Safari, Chrome, Edge, Firefox)
- Internet connection on first launch; offline operation afterwards
- iOS 14 or newer / Android 9 or newer / desktop OS with a current browser
- No traditional installation required
- Sufficient system performance for large CSV files (over 1 MB)

## 3. Installation as an App

The MD-Lambda-View application is implemented as a Progressive Web App (PWA). After the first launch in the browser, it can be added to the home screen like a native app. The app then starts in its own standalone window without the browser bar and also works without an internet connection. Of course, you can still use the application as a regular web page.

### 3.1 Installation on iPhone

- Open Safari (important: only Safari can install PWAs on iPhone — Chrome or Firefox will not work here).
- Open **https://mdauso.github.io/MD-Lambda.View/** or access it from **www.md-lambda-view.com**.
- Tap the share icon (square with an arrow pointing up, in the middle of the bottom bar).
- Tap **“Add to Home Screen”** in the menu.
- Confirm with **“Add”**.

MD-Lambda-View UG (haftungsbeschränkt)
Managing Director: Mario Deuse
Taubenbrunnen 13
37120 Bovenden
Tel.: +49 (0) 171 7563470

VAT: 20/200/42392
HRB: 207837
Registered office: Bovenden
Register court: AG Göttingen
WEEE: DE 52254643


info@md-lambda-view.com
www.md-lambda-view.com

## 3.2 Installation on Android

- Open Chrome and go to **https://mdauso.github.io/MD-Lambda-View/** or access it from **www.md-lambda-view.com**.
- After a short time the **“ Install App”** button appears on the home page — tap it.
- Confirm with **“Install”**.

If the install button does not appear: use the Chrome menu (three dots, top right) → “Install app” or “Add to Home screen”.
On Windows, the easiest way to install is via **Microsoft Edge** or **Chrome** — both are equally well suited because they are based on the same Chromium engine.

## 3.3 Installation in Microsoft Edge

- Open Edge and go to **https://mdauso.github.io/MD-Lambda-View/** or access it from **www.md-lambda-view.com**.
- To the right of the address bar, a small app icon appears (a screen with a downward arrow or a “+” sign). Click it.
- Alternatively, use the menu at the top right (three dots ⋯) → “Apps” → “Install this site as an app”.
- Confirm with “Install”.

## 3.4 Installation in Google Chrome

- Open Chrome and go to **https://mdauso.github.io/MD-Lambda-View/** or access it from **www.md-lambda-view.com**.
- The app icon (screen with a downward arrow) appears on the right side of the address bar. Click it.
- Alternatively, use the menu (three dots) → “Save and Share” → “Install page as app” (in newer Chrome versions) or “Cast, Save and Share” → “Install App”.
- Confirm with “Install”.

# 4. CSV File Format

The CSV file must be in the following format:

*CSV file header*
Time (s);RPM (rpm);Throttle (%);Voltage (V);Lambda value

**Requirements:**

- Separator: semicolon ( ; )
- Decimal separator: period ( . ) or comma ( , )
- At least 5 columns
- Comment lines start with # and are ignored (e.g. boot count)
- RPM, throttle position and lambda value must contain valid numeric values

**Plausibility ranges (typical):**

| Parameter | Valid Range |
|---|---|
| RPM | 0 to 20000 rpm |
| Throttle | -1 % to 105 % |
| Lambda value | 0.5 to 2.5 |

Invalid values are automatically discarded.

## 5. Operation

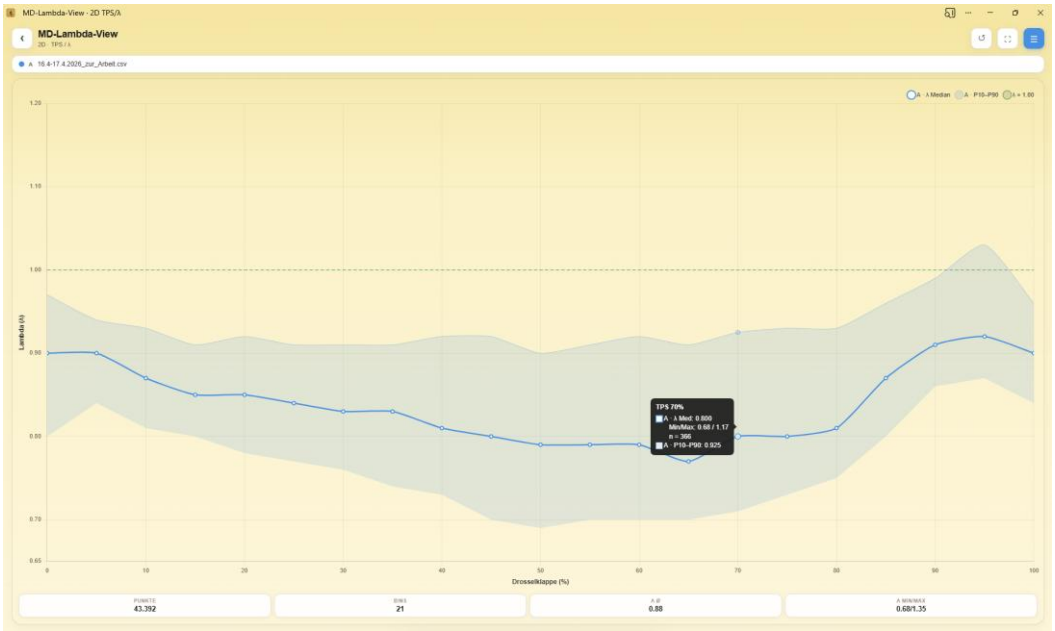
After starting the application, an overview page appears with two analysis tiles:

- On the home page, choose the desired analysis: **2D** for TPS · λ or **3D** for the 3D map.
- Load a CSV file or open it via the settings menu (☰ at the top right).
- In the **“File”** section, tap **“Select CSV file”**.
- Select the CSV file from your file manager.
- The data is automatically processed and displayed.

Use the arrow icon (‹) at the top left to return from an analysis to the home page.

## 6. 2D Analysis TPS · λ

The 2D analysis shows the lambda median against throttle position. The horizontal axis represents the throttle from 0 to 100 percent, the vertical axis the lambda value. The blue line shows the median for each throttle range, while the light-blue band around it represents the scatter of the measured values.




MD-Lambda-View UG (haftungsbeschränkt)
Managing Director: Mario Deuse
Taubenbrunnen 13
37120 Bovenden
Tel.: +49 (0) 171 7563470

VAT: 20/200/42392
HRB: 207837
Registered office: Bovenden
Register court: AG Göttingen
WEEE: DE 52254643


info@md-lambda-view.com
www.md-lambda-view.com

## 6.1. Basic Principle of the 2D View

The raw data consists of individual measurement points:

| *Tuple per measurement point*<br>(Throttle, Lambda) |
|---|

Example:

| Throttle | Lambda |
|---|---|
| 15 % | 0.91 |
| 16 % | 0.94 |
| 15 % | 0.89 |
| 15 % | 0.87 |

Because real measurements scatter, the values are grouped into throttle bins. For each bin, statistical key figures are calculated:

- **Median** (centre value) — forms the solid line
- **Quantiles** (P10 / P25 / P75 / P90) — form the scatter band
- **Min and Max** — range of the measured values

Result: a smooth, robust lambda curve across the full throttle range.

## 6.2. Bin Settings

### Throttle Step %

Defines the step size of the throttle bins.

| Input | Effect |
|---|---|
| 5 | 0 %, 5 %, 10 %, … (21 bins) |
| 2 | 0 %, 2 %, 4 %, … (51 bins) |
| 10 | 0 %, 10 %, 20 %, … (11 bins) |

smaller value → higher resolution, more detail
larger value → stronger smoothing, less detail

## 6.3. Scatter Band Modes

The scatter band around the median line can be shown in three modes:

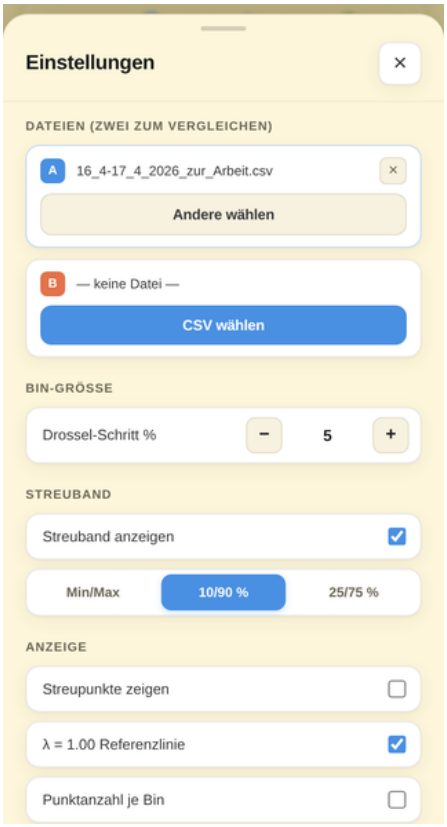
| Mode | Meaning | Application |
|---|---|---|
| Min/Max | full range | Spotting outliers |
| P10–P90 | middle 80 % of the values | Default mode, robust |
| P25–P75 | interquartile range | Tight scatter analysis |

## 6.4. Display Options

The following display elements can be individually enabled or disabled in the settings menu:

- **Show scatter band** — light-blue scatter area around the median line
- **Show scatter points** — all raw measurement values as semi-transparent points
- **λ = 1.00 reference line** — dashed green line
- **Point count per bin** — shows the number of measurement values per bin as a label
- **Tooltip on tap** — data display when tapping the line

In addition, the displayed range of the λ axis can be limited via the Min and Max fields.

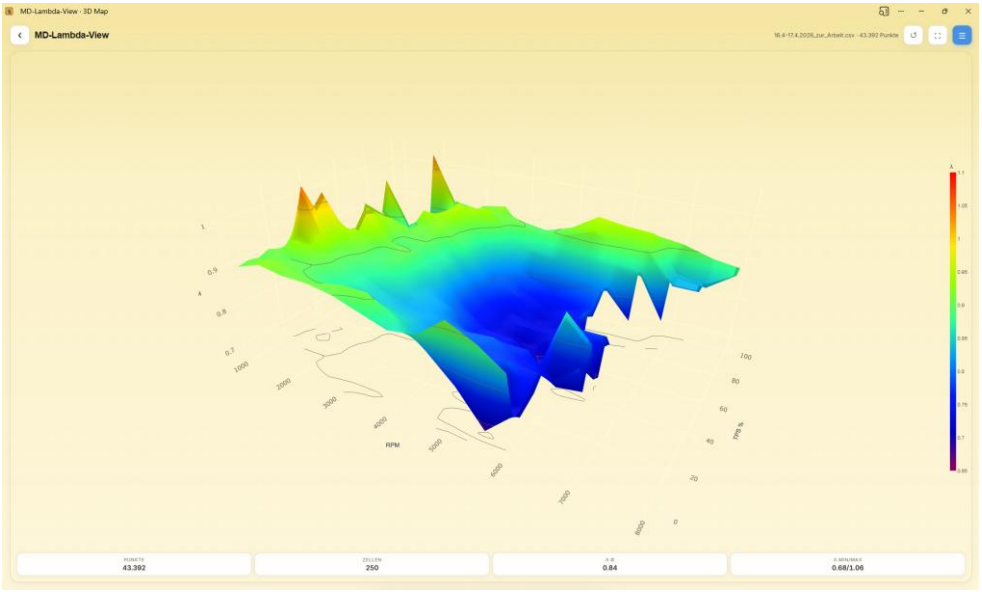


## 7. 3D Map RPM · TPS · λ

The 3D map shows the lambda behaviour across the entire engine map:

- **X axis:** RPM (engine speed)
- **Y axis:** Throttle position (%)
- **Z axis:** Lambda value (height and colour)

The result is an interactive 3D mixture map, comparable to an injection map.




### 7.1. Bin Settings

| Parameter | Function |
|---|---|
| RPM step | Step size of the RPM bins (default 500 rpm) |
| Throttle step % | Step size of the throttle bins (default 5 %) |

### 7.2. Aggregation Modes

Each grid cell (RPM × throttle) typically contains several measurement values. A representative value must be calculated from these — this process is called aggregation.

$$\Lambda_{cell} = f(\lambda_1, \lambda_2, \ldots, \lambda_n)$$

The function f() depends on the selected aggregation mode. The app offers four modes:

#### Median (Default)

The middle value of a sorted list.

- ✓ Very robust against outliers
- ✓ Ideal for real-world road runs
- ✓ Stable during load changes
- ✓ Recommended for practical tuning

MD-Lambda-View UG (haftungsbeschränkt)
Managing Director: Mario Deuse
Taubenbrunnen 13
37120 Bovenden
Tel.: +49 (0) 171 7563470

VAT: 20/200/42392
HRB: 207837
Registered office: Bovenden
Register court: AG Göttingen
WEEE: DE 52254643


info@md-lambda-view.com
www.md-lambda-view.com

### Mean (Arithmetic Average)

$$\Lambda = (1/n) \cdot \Sigma \lambda_i$$

- ✓ Smooths measurement noise
- ✓ Good for stable dyno data
- ✓ Sensitive to outliers

### Min / Max

Shows the lowest or highest lambda value per grid cell respectively. Suitable for worst-case analysis and identifying critical peaks.

## 7.3. Color Scale

| Setting | Function |
|---|---|
| Min | Lower limit of the colour scale (typically 0.65) |
| Max | Upper limit of the colour scale (typically 1.10) |
| Color scale | Selection: Rainbow, Viridis, Cividis, Jet, Plasma, Inferno |

For analysing carburetor data, Rainbow is recommended — rich areas appear red, lean areas blue.

## 7.4. Camera Perspectives

Preset perspectives are available via the settings menu:

| View | Function |
|---|---|
| ISO | Isometric view (default) |
| Top | Top-down view — like a 2D heatmap |
| RPM | Side view along the RPM axis |
| TPS | Side view along the throttle axis |

The ↺ button at the top left resets the camera to the default ISO view.

# 8. Comparing Two Logs (Before/After)

The 2D analysis supports displaying two CSV files simultaneously. Typical application: evaluating a jet or jet-needle change in direct comparison.

- Open the settings menu (☰).
- Under **Files**, load the first CSV into slot **A** (blue marker).
- Load the second CSV into slot **B** (orange marker).
- Both median lines are shown in the chart, each run in its own colour.

The scatter band, scatter points and all other display options apply to both logs equally.

### 8.1. Comparison Table

In comparison mode, the bin table in the settings menu also shows the difference Δ between both logs:

| Color | Meaning |
|---|---|
| Green | Difference below 0.02 — practically identical |
| Red | B is richer than A — jetting made it richer |
| Blue | B is leaner than A — jetting made it leaner |

## 9. Interpreting Lambda Values

The green dashed line at λ = 1.00 marks the stoichiometric mixture. Values below it are rich, values above are lean.

| λ Value | Meaning | Typical Range |
|---|---|---|
| < 0.80 | very rich | Full-load enrichment, cold start |
| 0.85 – 0.92 | power mixture | Full load on gasoline engines |
| 0.95 – 1.00 | stoichiometric | Part load on modern engines |
| 1.00 – 1.10 | lean | Idle, overrun, economy operation |
| > 1.15 | very lean | Risk of knock, overheating |

### 9.1. Typical Findings

#### Main Jet Too Large

The median line drops noticeably in the throttle range from about 60 % onwards and falls below λ = 0.80. The scatter band is narrow, the values consistent. Action: install a smaller main jet, lower the jet needle by one position, or both.

#### Air Leak at Idle

In the 0–15 % throttle range, the median is at λ = 1.05 to 1.15, and the scatter band is wide. Action: check carburetor gaskets and intake rubber, readjust the idle-mixture screw.

#### Disturbed Transition Range

Between 20 % and 40 % throttle, the median fluctuates and the scatter band becomes noticeably wider. Action: check the needle jet and needle, replace if necessary, or change the needle position.

MD-Lambda-View UG (haftungsbeschränkt)
Managing Director: Mario Deuse
Taubenbrunnen 13
37120 Bovenden
Tel.: +49 (0) 171 7563470

VAT: 20/200/42392
HRB: 207837
Registered office: Bovenden
Register court: AG Göttingen
WEEE: DE 52254643

## 10. Interactive Controls

### 10.1. 2D Analysis

| Gesture / Input | Effect |
|---|---|
| Two-finger pinch (touch only) | Zoom |
| Drag one finger (touch only) | Pan (move) |
| Tap or click on the line | Show tooltip with lambda value |
| ↺ button | Reset zoom and pan |

### 10.2. 3D Map

| Gesture / Input | Effect |
|---|---|
| Drag one finger / left mouse button | Rotate the model |
| Two-finger pinch / scroll wheel or middle mouse button | Zoom |
| Two-finger drag / right mouse button | Pan (move) |
| Double tap / double click | Reset view |
| Hover (mouse) | Tooltip with RPM, TPS, λ |

### 10.3. Fullscreen Mode

The ⛶ button to the right of the ↺ button switches the app into fullscreen mode. In fullscreen mode, the chart area is maximised, while the header and all cards are hidden. To leave fullscreen mode, use the ⤢ button or the ESC key.

## 11. Typical Application

The analyses can be used to detect the following:

- Lean spots in the part-load range
- Over-fueling or excessive leaning at full load
- Transition problems between the idle and main-jet systems
- Inconsistent load-change zones
- Effects of mechanical defects (air leaks, faulty seals)

MD-Lambda-View UG (haftungsbeschränkt)
Managing Director: Mario Deuse
Taubenbrunnen 13
37120 Bovenden
Tel.: +49 (0) 171 7563470

VAT: 20/200/42392
HRB: 207837
Registered office: Bovenden
Register court: AG Göttingen
WEEE: DE 52254643

Particularly useful for:

- Carburetor tuning
- Injection-map optimisation
- Dyno performance analysis
- Road measurements with the MD-Lambda-View data logger

A “clean” mixture curve shows:

- smooth transitions between the throttle ranges
- no abrupt peaks
- a narrow, consistent scatter band

Problematic areas show:

- isolated peaks or dips
- sudden colour jumps in the 3D map
- a wide or irregular scatter band
- empty grid cells (3D map) — an indication of too few measurement values in that area

MD-Lambda-View UG (haftungsbeschränkt)
Managing Director: Mario Deuse
Taubenbrunnen 13
37120 Bovenden
Tel.: +49 (0) 171 7563470

VAT: 20/200/42392
HRB: 207837
Registered office: Bovenden
Register court: AG Göttingen
WEEE: DE 52254643


info@md-lambda-view.com
www.md-lambda-view.com