DPF Monitor v3

User guide

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1. Introduction

The DPF Monitor is a compact device designed to monitor the status of the diesel particulate filter (DPF) in VAG group vehicles. The device supports engine control units (ECUs) with the CAN UDS bus protocol (4-digit engines starting with Cxxx and Dxxx).

The device allows for real-time viewing of key parameters, enabling conscious control of the DPF regeneration process and preventing expensive failures. It's important to remember that viewing and analyzing these parameters is just as crucial as receiving information about the regeneration itself. Thanks to the DPF Monitor, you will be promptly informed when the filter starts to regenerate, which helps prevent the interruption of this process.

The device connects to the car via the OBD2 port, and all data is displayed on a dedicated screen. It is an ideal tool for any driver who wants to have full control over the health of their DPF.

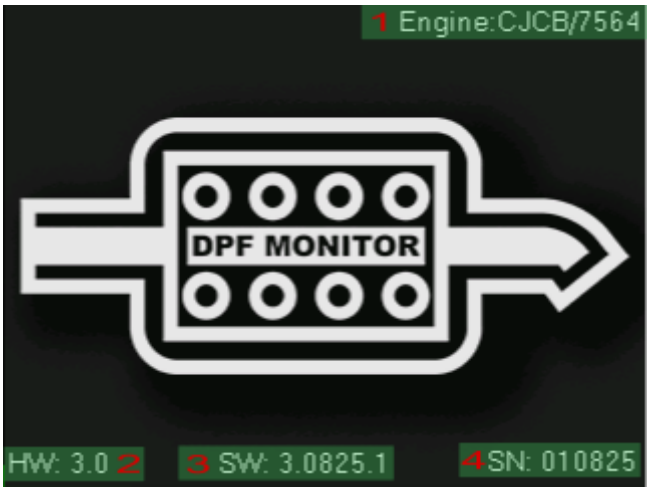
1.1 Functions

- Reads engine and DPF parameters
- Provides audible and visual alerts on the display when a regeneration is in progress
- Saves logs to a microSD card
- Stores regeneration history
- Reads and clears engine Diagnostic Trouble Codes (DTCs)
- Performs a quick differential pressure test
- Features day/night mode

1.2 Technical specification

Operating Voltage	6.5-17V (24V MAX)
Current Draw (operating)	~20mA (night mode) – ~60mA (day mode)
Current Draw (sleep)	<7mA@13.5V
Supported CAN Protocol	UDS
Screen Resolution	320x240
Case Material	ASA (display), PETG (OBD2 module)
Cable Length	1.40m

2. Start page



Picture 1 – Start page

The home screen displays key information about the device and its connection status:

1. **Engine code / SW number:** (When connecting to the vehicle, "Connecting..." will be shown).
2. **Device hardware version.**
3. **Device software version.**
4. **Device serial number.**

3. Main page

Picture 2 – main page

3.1 General Information

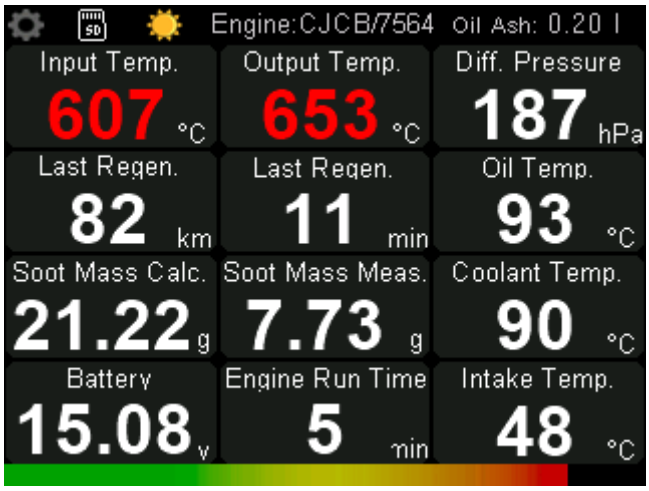
❖ On the first data screen, you can read the following parameters:

- Engine code and engine control unit (ECU) software number
- DPF inlet and outlet temperature
- Differential pressure
- Last regeneration distance (in kilometers)
- Last regeneration time (in minutes)
- Oil temperature
- Calculated soot mass
- Measured soot mass
- Coolant temperature
- Battery voltage
- Time since engine start
- Intake air temperature
- Oil ash amount

❖ At the top of the screen, you can access the **menu**, view information about the **SD card** (for more details, see section 4.9 "Saving to SD card"), and check the current **day/night mode**.

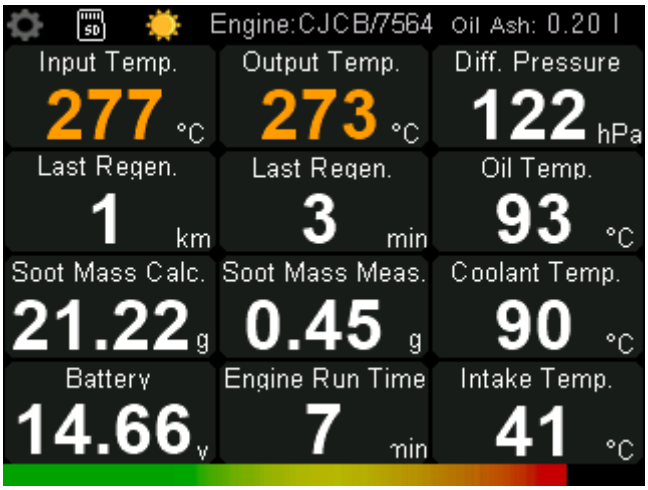
❖ At the bottom of the screen, a green progress bar shows the **DPF's fill level**. This bar is scaled from 0 to 24g and displays the calculated soot mass value.

❖ During a DPF regeneration, the temperature values will turn red, as shown in the picture below:



Picture 3 – DPF Regeneration process

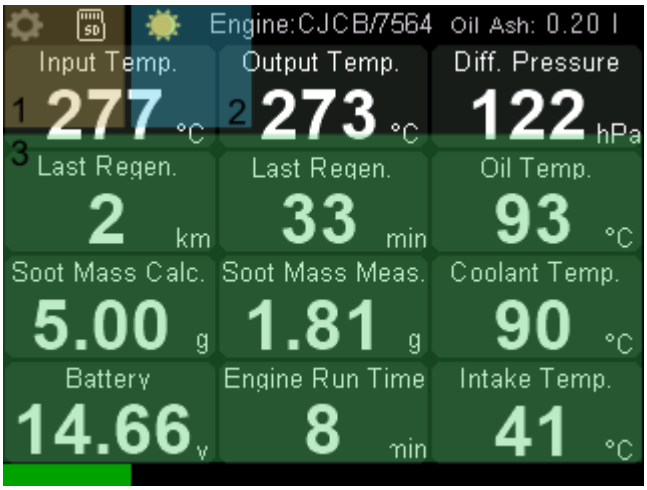
❖ During a passive regeneration, the temperatures will light up in orange:



Picture 4 – Passive regeneration

❖ Touch Screen Points

- To enter the **menu**, change the **page**, or adjust the **screen brightness**, press the screen in the designated areas shown below:



Picture 5 – Touch area

1. Enter Menu
2. Change Brightness
3. Change Page

3.2 Data description

All the information below is based on information gathered from the internet and personal experience.

1. Software Version

The software version of the engine control unit (ECU) affects the frequency of DPF regeneration.

For example, in an Audi A4 B8, post-Dieselgate software versions are numbered: 9977, 9978, 9979, 9980, and 9981. This leads to more frequent DPF regenerations (every 250-300 km). The calculated soot mass increases at a faster rate compared to ECUs with lower **software versions.**

2. Oil Ash Residue

This value indicates the amount of ash filling the filter. This value is not burned off and increases with the vehicle's mileage. Depending on the engine, this value is given in liters or grams. For 2.0 TDI engines, the maximum ash fill value is 0.175L or 60g. Exceeding these values may require filter replacement or cleaning, but not always. It depends on driving style and routes.

3. Temperature Before and After the DPF

During normal driving, temperatures do not exceed 350 degrees Celsius. With dynamic driving, the temperature can reach up to 450 degrees Celsius. During regeneration, temperatures range from 550 to 700 degrees Celsius.

- Passive Regeneration: A spontaneous DPF regeneration that occurs when the temperature exceeds 350 degrees. My observations suggest that passive regeneration can also happen at lower temperatures, resulting in a decrease in the measured soot mass.

- Active Regeneration: A DPF regeneration forced by the ECU. For the filter to regenerate properly, the minimum temperature should be 580 degrees. If the car does not reach this temperature during regeneration, it indicates a problem with the ancillary equipment.

To achieve the correct temperatures, you should not accelerate aggressively or use engine braking (as this turns off the additional fuel injection for DPF regeneration). You should maintain a steady speed within the 2,000-2,500 RPM range.

4. Differential Pressure

This is the most important parameter for analyzing DPF blockage.

Differential pressure is measured before and after the DPF. Based on this value, you can determine the condition of your filter. For more information, please refer to section 4.2 "Differential Pressure Test."

4a. Differential Pressure Offset This parameter can tell you a lot about the health of your sensor. The value should be close to zero.

5. Kilometers Since Last Regeneration

This shows how many kilometers have passed since the last regeneration. Depending on the car, this can be anywhere from 200 km to even 800-1000 km. After a regeneration is complete, this value resets to zero.

6. Soot Mass Calculated

This is the soot mass calculated by the ECU. Based on this value, regeneration should start when the value reaches 14g to 24g. This value should always be higher than the measured soot mass. After regeneration, the calculated soot mass drops to around 2.5-5g.

My observations show that for cars driven more in the city, regeneration tends to start closer to the 24g limit. However, during highway driving, if the engine conditions are right, regeneration might start earlier (even before 20g).

For cars with pre-Dieselgate software, it's possible to initiate regeneration using cruise control. If the DPF temperature is around 300 degrees (during a highway drive) and the calculated mass is above 14g, the ECU will see that the conditions are right and will initiate a DPF regeneration within a few seconds or minutes.

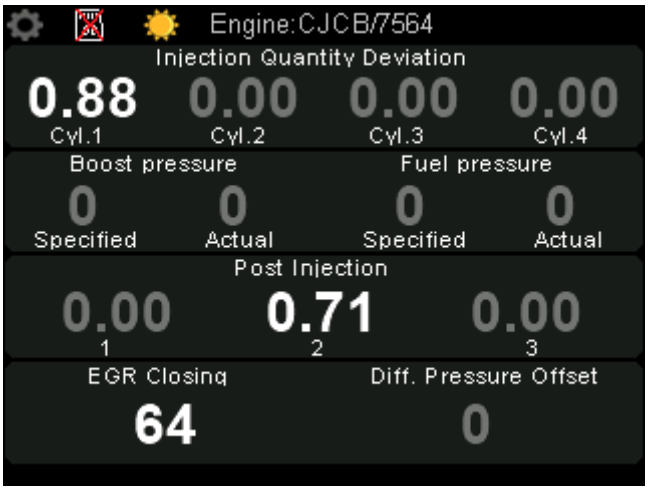
Using cruise control for regeneration has another advantage: when regenerating without it, the process usually ends around 5g. With cruise control, the DPF regenerates longer, down to about 2.5g, resulting in a more thorough cleaning.

7. Soot Mass Measured

The measured soot mass should never increase faster than the calculated mass. If this happens (e.g., calculated soot mass is 11g and measured is 18g), it may indicate a problem with the engine's ancillary equipment or the filter itself. This value is calculated based on engine load, engine speed, and, most importantly, differential pressure.

When the measured value increases faster, it triggers the regeneration process, and the measured and calculated soot values equalize. After regeneration, the value drops to 0g or can even be negative (in which case you could say the DPF is in better condition than the ECU expects).

3.3 Second page



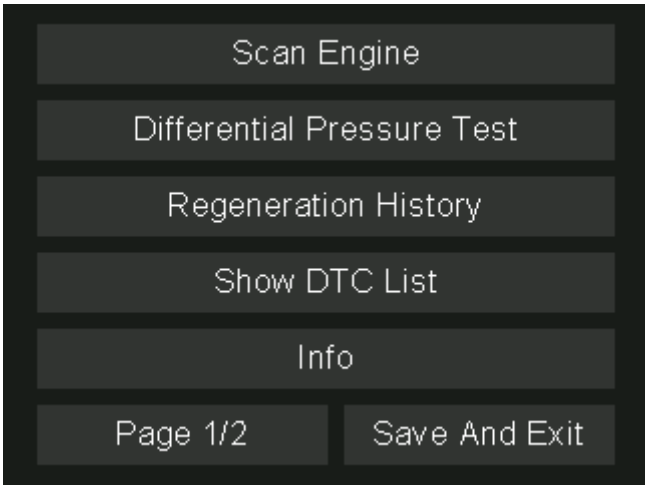
Picture 6 – Second page

On the second page, titled "Advanced page" (see section 4.7), you can read parameters such as:

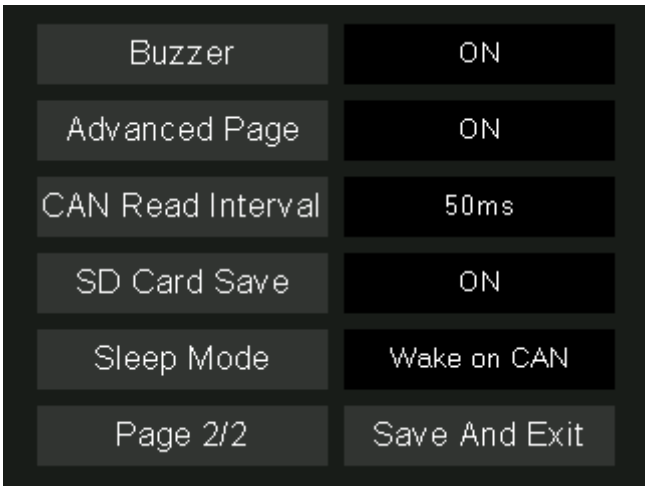
- Injector corrections for each cylinder
- Specified and actual turbocharger pressure
- Specified and actual fuel pressure
- Post-injection status
- EGR valve closed status
- Differential pressure sensor offset

4. Menu

Entering the settings is done by touching the screen in the area marked on the image, "Figure 5 - touch area."

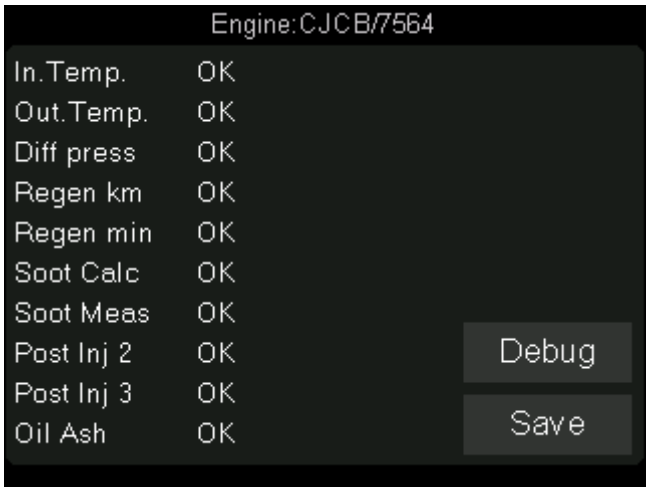


Picture 7 - Menu page 1



Picture 8 - Menu page 2

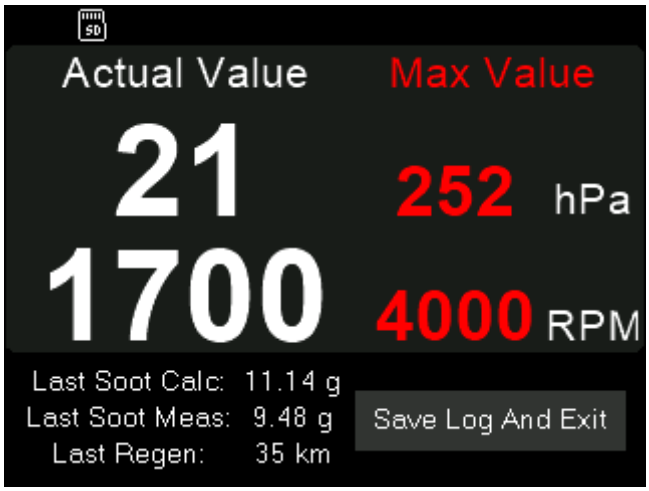
4.1 Scan Engine



Picture 9 - Scan Engine

By default, the device turns on by reading the engine code and assigns the appropriate code table to the CAN frame to read data. If a parameter isn't being read, you can try the code search function. This function sends all available codes to the engine control unit and waits for a response. If a parameter cannot be read, **"N/A"** will be displayed. This means the engine control unit does not make that specific parameter available. For example, with CAGA/CAHA engines, "Post Injection" might be one such parameter. Depending on the engine's software version, some simply don't have it.

4.2 Differential Pressure Test



Picture 10 - Differential Pressure Test Page

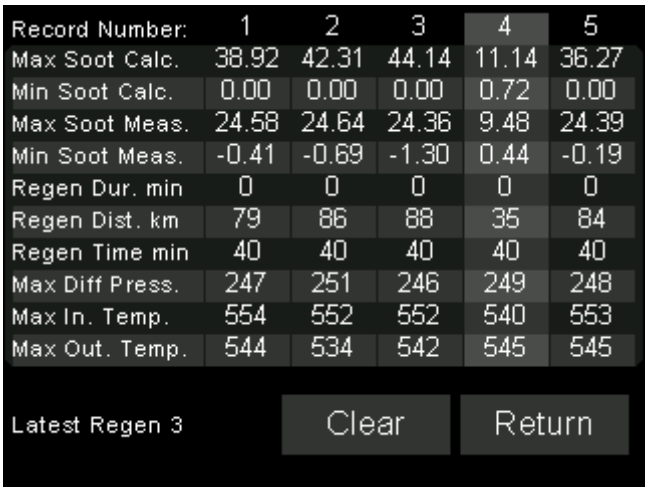
This function allows for a quick pressure test. On the left side of the screen, the **current values** read from the ECU are displayed in white. On the right, the **highest recorded maximum values** are displayed in red. The test is automatically saved to the SD card (if inserted).

To perform the test, the best method is to engage 3rd gear and press the accelerator to the floor. The measurement should be performed up to approximately 4,000 RPM. The values recorded at 4,000 RPM should be interpreted according to the table below:

0-100hPa	DPF in perfect condition.
101-200hPa	DPF in good condition.
201-300hPa	DPF is slowly starting to clog.
301-400hPa	It's worth investigating, something is starting to happen with the DPF.
400-450hPa	DPF is clogged.
>450hPa	DPF is in very bad condition; above this value, the engine control unit cuts power

Picture 11 - Interpretation of the results

4.3 Regeneration History



Picture 12 – Regeneration History page

On this screen, you can read the history of the last five regenerations.

Parameter Descriptions:

- **Max Soot Calc.** – Maximum registered calculated soot mass value
- **Min Soot Calc.** – Minimum registered calculated soot mass value
- **Max Soot Meas.** – Maximum registered measured soot mass value
- **Min Soot Meas.** – Minimum registered measured soot mass value
- **Regen Dur. Min** – DPF regeneration duration in minutes
- **Regen Dist. Km** – Distance traveled since the last regeneration in kilometers
- **Regen Time min** – Time elapsed since the last regeneration in minutes
- **Max Diff Press.** – Maximum registered differential pressure
- **Max In. Temp.** – Maximum registered inlet temperature
- **Max Out Temp.** – Maximum registered outlet temperature

The gray-highlighted column shows the current data recorded up to the present moment, before a regeneration. Once a regeneration is complete, this column shifts to the right, and its place is taken by the data from the latest regeneration. After all five records are filled, the device will start overwriting the first record.

To reset all records, hold the **"Clear"** button for approximately 3 seconds.

4.4 Show DTC List

Picture 13 – DTCs read page

The device can read up to 12 Diagnostic Trouble Codes (DTCs).

- **Pending** codes are those the system has detected but have not yet triggered an alert.
- **Current** codes are confirmed fault codes. Unlike pending codes, these indicate permanent and verified issues within the system.

4.5 Info

Picture 14 – Info page

4.6 Buzzer

If necessary, you can turn off the buzzer by tapping "Buzzer" on the screen.

4.7 Advanced page

You have the option to enable or disable the second data page. This prevents accidental screen switching and avoids interrupting DPF logs, as data from the second page is not recorded.

4.8 CAN Read Interval

You have the option to enable or disable the second data page. This prevents accidental screen switching and avoids interrupting DPF logs, as data from the second page is not recorded.

4.9 Saving to an SD Card

- You can enable saving to an SD card on the second page of the settings.
- Files are saved in **.csv** format and are separated by regeneration cycles. This means a new log_dpf.csv file is created after each completed regeneration (e.g., log_dpf_1.csv, log_dpf_2.csv, log_dpf_3.csv, etc.).

  Here are the icons related to the SD card on the main screen:

   - SD card is not inserted

   - SD card is inserted, and saving is active

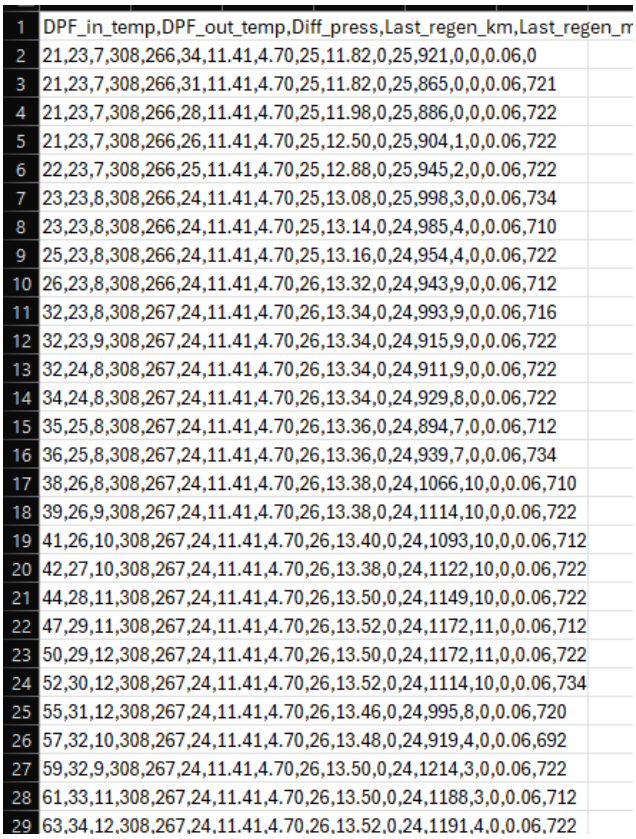
   - SD card is inserted, but saving is turned off

   - SD card is inserted, but there was a read/write error (SD Card Error). In this case, you should disconnect and reconnect the device. If the problem reoccurs, try a different card.

- **Supported cards:** Up to 32GB, formatted as **FAT32**.
- The following values are logged in the **.csv file:**

Parameter Name	Description
DPF_in_temp	DPF inlet temperature
DPF_out_temp	DPF outlet temperature
Diff_press	Differential pressure
Last_regen_km	Distance since last regeneration in kilometers
Last_regen_min	Time since last regeneration in minutes

Oil_temp	Oil temperature
Soot_mass_calc	Calculated soot mass
Soot_mass_meas	Measured soot mass
Coolant_temp	Coolant temperature
Batt_voltage	Battery voltage
Engine_time	Time since engine start
Intake_temp	Intake air temperature
Engine_speed	Engine speed (RPM)
Vehicle_speed	Vehicle speed (km/h)
Post_injection2	Post-injection status
Oil_Ash	Oil ash amount
FunctionTimeElapsed	Time in milliseconds between data writes to the microSD card

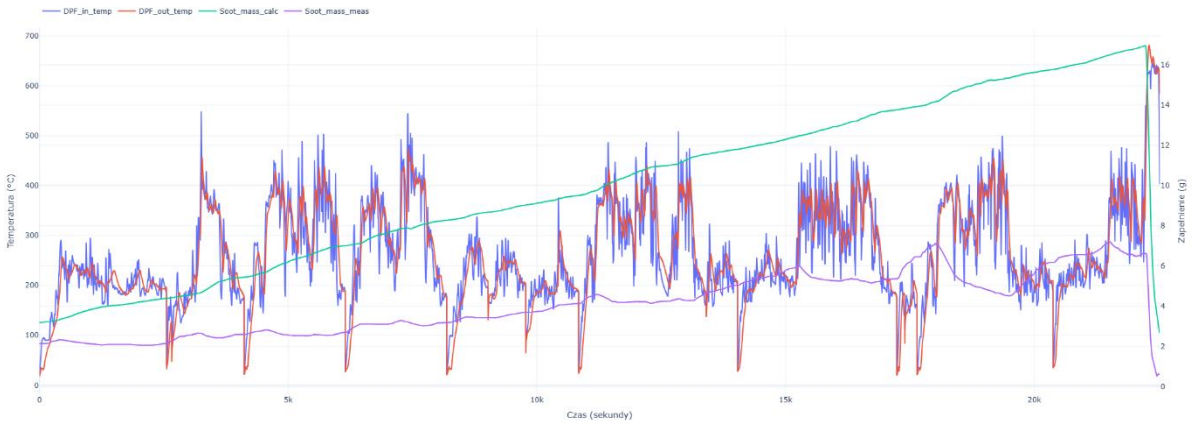


	DPF_in_temp,DPF_out_temp,Diff_press,Last_regen_km,Last_regen_m
2	21,23,7,308,266,34,11.41,4.70,25,11.82,0,25,921,0,0,0.06,0
3	21,23,7,308,266,31,11.41,4.70,25,11.82,0,25,865,0,0,0.06,721
4	21,23,7,308,266,28,11.41,4.70,25,11.98,0,25,886,0,0,0.06,722
5	21,23,7,308,266,26,11.41,4.70,25,12.50,0,25,904,1,0,0.06,722
6	22,23,7,308,266,25,11.41,4.70,25,12.88,0,25,945,2,0,0.06,722
7	23,23,8,308,266,24,11.41,4.70,25,13.08,0,25,998,3,0,0.06,734
8	23,23,8,308,266,24,11.41,4.70,25,13.14,0,24,985,4,0,0.06,710
9	25,23,8,308,266,24,11.41,4.70,25,13.16,0,24,954,4,0,0.06,722
10	26,23,8,308,266,24,11.41,4.70,26,13.32,0,24,943,9,0,0.06,712
11	32,23,8,308,267,24,11.41,4.70,26,13.34,0,24,993,9,0,0.06,716
12	32,23,9,308,267,24,11.41,4.70,26,13.34,0,24,915,9,0,0.06,722
13	32,24,8,308,267,24,11.41,4.70,26,13.34,0,24,911,9,0,0.06,722
14	34,24,8,308,267,24,11.41,4.70,26,13.34,0,24,929,8,0,0.06,722
15	35,25,8,308,267,24,11.41,4.70,26,13.36,0,24,894,7,0,0.06,712
16	36,25,8,308,267,24,11.41,4.70,26,13.36,0,24,939,7,0,0.06,734
17	38,26,8,308,267,24,11.41,4.70,26,13.38,0,24,1066,10,0,0.06,710
18	39,26,9,308,267,24,11.41,4.70,26,13.38,0,24,1114,10,0,0.06,722
19	41,26,10,308,267,24,11.41,4.70,26,13.40,0,24,1093,10,0,0.06,712
20	42,27,10,308,267,24,11.41,4.70,26,13.38,0,24,1122,10,0,0.06,722
21	44,28,11,308,267,24,11.41,4.70,26,13.50,0,24,1149,10,0,0.06,722
22	47,29,11,308,267,24,11.41,4.70,26,13.52,0,24,1172,11,0,0.06,712
23	50,29,12,308,267,24,11.41,4.70,26,13.50,0,24,1172,11,0,0.06,722
24	52,30,12,308,267,24,11.41,4.70,26,13.52,0,24,1114,10,0,0.06,734
25	55,31,12,308,267,24,11.41,4.70,26,13.46,0,24,995,8,0,0.06,720
26	57,32,10,308,267,24,11.41,4.70,26,13.48,0,24,919,4,0,0.06,692
27	59,32,9,308,267,24,11.41,4.70,26,13.50,0,24,1214,3,0,0.06,722
28	61,33,11,308,267,24,11.41,4.70,26,13.50,0,24,1188,3,0,0.06,712
29	63,34,12,308,267,24,11.41,4.70,26,13.52,0,24,1191,4,0,0.06,722

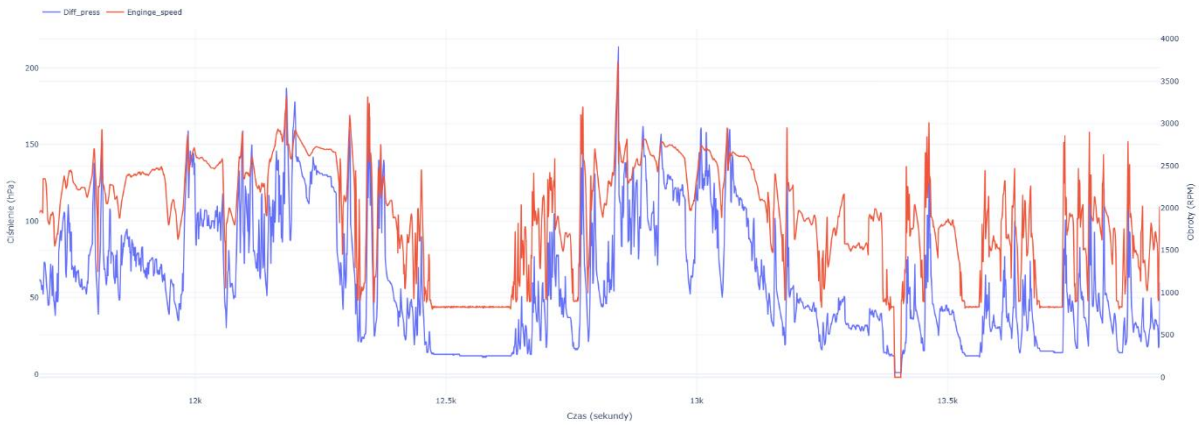
Picture 15 -Example log .csv

- Data saved in the **.csv file** can be imported into any graphing program. The first row of the file contains the parameter names.

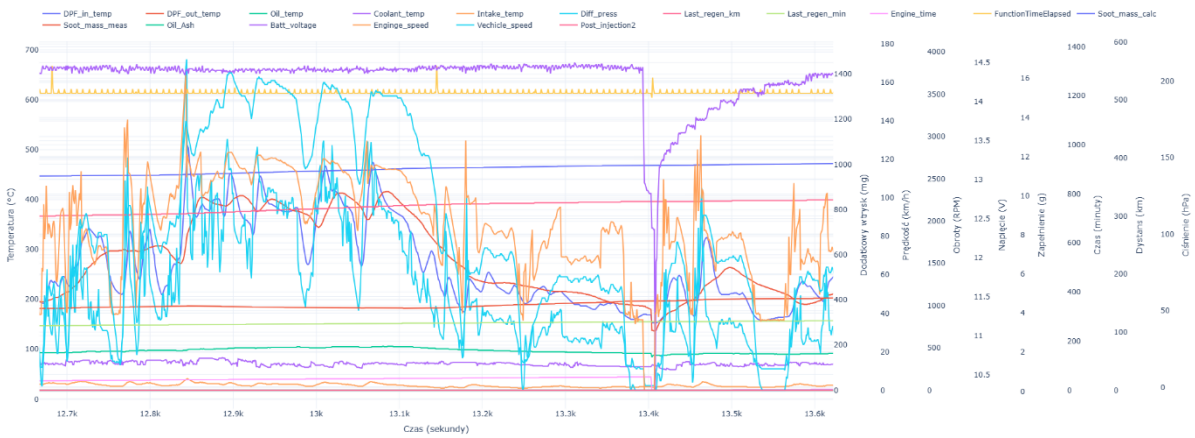
  Below is an example of a graphical visualization:



Picture 16 – Example graph 1



Picture 17 - Example graph 2



Picture 18 - Example graph 3

4.10 Wake-up modes

You can choose between two wake-up modes: **Wake on CAN** (primarily available for Audi) or **Wake on Engine** (recommended for VW, Škoda, and Seat).

- **Wake on CAN:** In Audi vehicles, the OBD2 port is designed to go into sleep mode a few seconds after the engine is turned off, making it impossible to communicate with the car. The system briefly wakes up for a few seconds when an event occurs, such as opening the driver's door or inserting the key into the ignition.
- **Wake on Engine:** For VW, Škoda, and Seat vehicles, you should select this function because the OBD2 port doesn't go to sleep like in Audis; data is transmitted continuously. By choosing this option, the device will only wake up when the engine is started.

5. Firmware update

To update the device's software, follow these steps:

1. **Transfer the update file** to a microSD card.
2. **Disconnect the device** from the OBD2 port.
3. **Insert the microSD card** into the device.
4. **Reconnect the device** to the OBD2 port.

The device will automatically detect the new file and begin the update. A message about the file upload will appear on the display, and the buzzer will signal the process. Once the update is complete, the device will return to normal operation, and the update file will be deleted from the microSD card.