

### SCREEN 7: ACTUAL BATTERY CAPACITY TEST in kWh

**Actual battery capacity in kWh tested at odometer value** when fully charged to 100% overnight at the last test. **Battery state of charge (SOC)** in %. This method is more practical than a discharge test obliging the user to drive hundreds of km in one go and with complex regeneration energies to deal with. Carried out several months apart, this test indicates **the usable energy of the battery at a specific odometer value with a history of the last 5 tests**. After a few tests months or years apart you will see if your main car battery is still in good shape or **how is there is a noticeable battery degradation trend over time**. This is useful information along with battery State of Health (SOH) in screen 10.

**Lower the % State of charge (SOC) below 15%**. Drive close to your charging station before charging for the night. **IMPORTANT:** recommendation not to drop SOC below 8% to avoid running out of energy far from the charging station! **The average battery temperature (screen 1) should be above 16C**. The display does not allow the test to be carried out in winter if the battery is cold because too much energy may be lost in heat and falsify the results. The test takes into account that **not all the energy charged is completely usable**. The Amp hour battery capacity is constant over the full 0-100% SOC range, but not the energy in kWh because the battery voltage drops, **thus the distribution of energy is not linear over the whole range**. For instance on a 64 kWh Kona of 180 Ah capacity, 1% SOC represents 1.8Ah. At 100% SOC, the battery voltage is high at 408V and 1% SOC contains 1.8Ah x 408V = 0.73 kWh. The same 1% SOC near 0% at lower voltage has less energy typically (1.8Ah x 310V = 0.55 kWh.)

Make sure that the vehicle can recharge to 100% in its configuration. **The test cannot be completed if the car maximum allowed charge is not set to 100%**. When SOC is below 15%, i.e. 14% and less, the message POWER ON, START CHARGE 100% & WAIT appears. **Leave the vehicle running and plug in the charging station. Go back inside the vehicle and wait to see an % SOC increase of at least one %**. If you start charging at SOC 12%, wait till SOC 13% is achieved. This is so that the display knows the SOC percentage to the nearest decimal at 13.0%. The display will show: TEST STARTED, POWER OFF. **You can now turn off the car and let it charge completely to 100% overnight**. If you have to use the car for an emergency before it is fully charged, the test will be cancelled obviously and you could restart the procedure another time. **The next day start the vehicle**. The display will turn on automatically, connect to the car computer and calculate the actual battery capacity in kWh by extrapolating the energy in the lower end % of SOC according to the energy distribution mentioned previously. **The last 5 capacity test results at their respective odometer values can be viewed by pressing a BUTTON for 4 seconds then pressing a BUTTON for 1s to scroll through previous tests**.

### SCREEN 8: CUMULATIVE ENERGY

**Total cumulative energy charged (CEC)** in the battery (recharge and regeneration) in kWh which represents the total energy charged in your vehicle since it was put into service. **Cumulative energy discharged (CED)** that the battery has used in kWh since commissioning.

### SCREEN 9: ENERGY COUNTER

**Counter measuring the charged and discharged energy** of the battery in kWh. **Press ANY BUTTON at least 4 seconds** to reset the counter. It is useful, for example, to reset the counter before a slow or fast charge, before a short or long trip of several days to see the **energy gained and spent** by the vehicle battery. Note that during a drive the regeneration energy may slightly increase just like a charge of the vehicle. The counter data is kept in non-volatile memory and it is **always possible to change the screens normally** even if the counter is in operation.

### SCREEN 10: STATE OF HEALTH AND OPERATING TIME

The **state of health of the high voltage battery (SOH)** in %. A new battery starts at 100%, then over time the battery will eventually deteriorate and the value will decrease. This screen also displays the **total operating time** of the vehicle in **hours and minutes**. Note that operating time includes time when the car is OFF but is awake to maintain the 12v battery.

### OPTIONS AND UNITS CONFIGURATION SCREEN

On any screen, **press a BUTTON for at least 4 seconds then release** to access the **options configuration menu**. The first option **LANGUAGE** will be displayed indicating the interface language used: English or French. To change the interface language, **press a BUTTON for at least 4 seconds then release** and you will see the **new language selected** on the display. To **NOT MODIFY** the option and go to the next option, **press a BUTTON for 1 second then release**.

Repeat these same steps to view or modify all the options:

**Language:** English / French, **Temperature:** Celsius / Fahrenheit, **Distance:** km / miles

**Battery:** 64 kWh / 39 kWh (Kona model family) 77 kWh / 58 kWh (IONIQ 5 - EV6)

## **EVOBD2**

### **Mini OBDII Bluetooth Display for**

#### **Hyundai: Kona Electric - IONIQ 5**

#### **Kia: Niro EV - Soul EV (2020+) - EV6**

This product is used to display **data from your electric vehicle's computer** via **Bluetooth using the OBDII protocol**. Data presented by the display, although **hidden in the vehicle**, is made accessible by this tool in order to help you make better use of your vehicle. **Smart features** like **Recent-Based GOM** and **Average Trip Info** sets this product apart by offering new value-added features to improve your driving.

When **ordering the product specify the car model family to get the proper software version** and also the **proper USB cable** for your car.

**Version 2: Hyundai Kona EV, Kia Niro EV, Soul EV.**

**Version 5: Hyundai IONIQ 5, Kia EV6.**

### **ATTENTION: COMPATIBLE Bluetooth OBDII ADAPTER IS REQUIRED**

(See compatible adapters further in this manual)

**SECURE:** This smart display only gets vehicle information and cannot interfere with its operation in any way.

### **FEATURES**

- Possibility to mount the display **temporarily** or **permanently**
- **Compatibility** with several recent **Bluetooth OBDII adapters**
- **Automatic Adapter Pairing** that searches, finds, deals with necessary PINs to learn and pair with your adapter. Once **connected**, unless you change the adapter, **never** do the pairing process again
- **Plug & Play:** does not require long configuration steps necessary with other systems.
- **Alternative solution to mobile / application** like Torque Pro, however does not deal with error or diagnostic codes. **Free your smart phone for other tasks** like Android Auto or Apple CarPlay.
- **Store** your favorite screen, energy meter data and average vehicle consumption according to seasons and types of driving between vehicle uses.

### **SMART FEATURES**

- **RECENT-BASED GOM (GUESS-O-METER):** Unlike the vehicle's GOM which indicates the remaining range with a calculation based on hundreds of kilometers, the display's GOM **bases its calculations on the last 50 km or 30 minutes traveled**. The recent-based GOM prediction can thus give a **better idea of the remaining range if vehicle consumption and driving conditions differ or change suddenly**. See more explanations in the corresponding section.
- **ACTUAL BATTERY CAPACITY TEST in kWh:** You can measure the actual energy or capacity of the car battery at the actual odometer reading. This allows you to see the evolution of battery degradation over time. The last 5 capacity tests are logged in the test history with the odometer values.
- **TRIP AND AVERAGE SPEED INFO:** Information on the current trip such as the average speed traveled which is not shown in the vehicle dashboard. The vehicle has only an accumulated trip memory, but no single trip info (no "Trip B"). This shortcoming is filled by the display with this trip screen and the information for each individual trip.

**EVOBD2** will prevent you from regularly **mounting / dismounting your phone and opening an application** each time you use it.

### **BLUETOOTH OBDII ADAPTERS**

Several **OBDII Bluetooth adapters** work with the display. As the adapter can remain installed at any time, we recommend that you choose a **small** one (less risk of damaging it with your legs). Also some adapters go **dormant** after a delay and must be woken up by pressing a button. They are **not**

## RECOMMENDED COMPATIBLE OBDII BLUETOOTH ADAPTERS

The following Bluetooth adapters are compatible: Veepeak Bluetooth OBDCheck VP11, Veepeak OBDCheck BLE, Panlong OBDII Bluetooth scanner for Android, Vgate FORScan vLinker FD or FD++ for Android, Goldvery Car OBDII Scanner for Android.

## INSTALLATION AND PAIRING

If you **PURCHASED A KIT WITH THE ADAPTOR NO PAIRING IS REQUIRED.**

The OBDII Bluetooth adapter communicates with only **one device at a time**. Make sure that your mobile application such as Torque Pro is not already communicating with the adapter in order to use the display.

1 - **Connect the OBDII adapter** to the car port

2 - **Connect the display with the supplied USB-C cable to USB power.** (It is preferable to leave the CarPlay / Android USB port for your mobile because it remains powered for a few minutes after switching off the vehicle) Make sure **power of the port is OFF while the car is also OFF** to avoid power used by the display and not drain the 12v battery.

3 - **Start the car.** The display will attempt to connect to the adapter. As it is not yet paired with your adapter, it will indicate a connection error. **Wait approximately 40 seconds for the RESET / PAIR screen to show up.**

4 - **Press ANY BUTTON for at least 4 seconds then release.** The display will search for the adapter and then attempt to establish the connection. It will then try to connect and present the vehicle data. **Your module is installed and you can start using it!**

The display shows the **MAC address of the compatible OBDII adapter discovered** at pairing at the bottom of the connection screen. If the connection is not established, possibly another device has been detected nearby. In this case, please **turn off all other suspect Bluetooth devices like a smart phone and/or move your vehicle about 50 feet or 20 meters**, then start pairing again.

Once the communication between the display and the OBDII Bluetooth adapter is established, **pairing no longer needs to be redone.** It would be necessary to redo a new pairing **only in case you replace the OBDII adapter.**

During normal use if the display shows the **RESET / PAIRING screen**, it is likely that your **OBDII adapter was disconnected** or that there was occasional communication interference. This situation is rare and in this case make sure that the OBDII adapter is **properly connected, then press ANY BUTTON** to restart the display.

## USING THE DISPLAY

The EVOBD2 display has a series of 9 screens to show you the information.

**Press the RIGHT BUTTON to MOVE FORWARD** from one screen to another in a circular fashion (screen 1 -> screen 9 -> screen 1). **Press the LEFT BUTTON to MOVE BACKWARD** in the sequence of screens in a circular fashion as well.

### SCREEN 1: GENERAL INFORMATION

**Battery state of charge (SOC)** in %. **Average battery temperature** in C which is useful to consult because if the temperature is warm enough the fast charging power will be better and higher.

**Power** delivered by the battery in kW (positive number in red for discharge, negative number in green for charging or regeneration) **Indoor temperature** of the passenger compartment in C (different from the set temperature in the car's climate control)

### SCREEN 2: RECENT-BASED GOM (GUESS-O-METER)

**Battery state of charge (SOC)** in % alternating with **instant speed** (km/h or mph). A **mix of average battery consumption for the last 30 minutes of travel and past learned data in kWh/100km** for initial GOM calculation. Unit is shipped in "summer" mode and will adapt to seasons and driving styles after 5 drives longer than 30 minutes. **Remaining vehicle range (GOM)** in km/miles. Consumption kWh/100km is **computed from power & instant speed.**

**OPERATING PRINCIPLE:** Unlike the vehicle's GOM which indicates the remaining range according to a calculation based on the last few hundreds km traveled, the **recent-based GOM on the display bases its calculations on the last 50 km or 30 minutes traveled.** The recent-based GOM prediction can thus give a better idea of the remaining range if the vehicle's consumption and driving conditions differ from what has been driven in the past. The display analyzes the consumption during the first minutes of the journey while the vehicle's consumption stabilizes. During this period, the **initial GOM displayed is estimated from consumption data of previous trips.** After driving for 5 to 15 minutes, the display has enough information to gauge the vehicle's consumption and adapt the GOM prediction to current conditions. **If consumption is greater than**

**usual, the recent-based GOM will adapt faster than the vehicle's GOM and the remaining range will decrease more quickly.** Conversely, if the fuel consumption is lower, the recent-based GOM will decrease more slowly and the remaining range could even increase, which the vehicle's GOM does not do. Here are 2 examples of real situations to understand the usefulness of the recent-based GOM:

**CASE OF INCREASED CONSUMPTION:** you install **skis and/or a luggage rack on the roof** of your vehicle. As you start to drive, the vehicle obviously cannot account for the headwind and the added friction on the skis. This leads to a significant increase in consumption **compared to the long term history of the GOM of your vehicle.** At the start, the vehicle's GOM indicates 320 km and **290 km after 25 km traveled.** On the other hand, the recent-based GOM detects the increase in consumption and after the 25 km traveled, it indicates a **range of 230 km, which is closer to reality.** You can then change your plans and decide to do an early charging stop if necessary before arriving at your destination.

**CASE OF REDUCED CONSUMPTION:** after a **drive on the highway with high consumption of 16 kWh/100km** you arrive in town, the speed decreases and there is a fair amount of traffic. The vehicle's **consumption then drops to 12 kWh/100km** in the last minutes. The **vehicle's GOM indicates that there are 45 km remaining** while the **recent-based GOM indicates that you have 85 km remaining** at the same pace, which can reassure you. In certain **urban driving situations with very low consumption**, the range can exceed 500 or 600 km. **The recent-based GOM may reflect this increase in range unlike the vehicle's GOM.**

**IMPORTANT:** the EVOBD2 display is shipped by default with the **recent-based GOM in "SUMMER" mode with an initial default consumption.** If the display starts to be used in winter or in general so that it adapts to the driving style, it is **necessary to make up to 5 drives of at least 30 minutes so that the initial consumption adapts to the new season or driving style** and for the data to be realistic. Note also that the recent GOM is especially designed to be used on **long trips of more than 30 minutes.**

The **vehicle's GOM is of course always useful and essential**, but the **recent-based GOM is complementary** since it is based on recent consumption. Note that it is simple for the user to manually compare the accuracy of the GOMs by noting the odometer and GOMs at the start and finish. You can subtract the departure and arrival GOMs and compare them to the distance actually traveled. This is an objective method to validate the accuracy of each GOM if you so desire. Note: the **vehicle's GOM varies depending on the driving modes.** You will see that the GOM is higher in eco mode, it decreases in normal mode and is even smaller in sport mode. **The vehicle's GOM anticipates changes in consumption for its predictions. But in fact, there is only one recent-based GOM to have a clear picture of the remaining range, one prediction and not 3 possible scenarios.**

### SCREEN 3: TRIP AND AVERAGE SPEED INFO

**Travel time in hours and minutes** alternating with **odometer** (km or miles). **Distance traveled in km or miles. Average consumption of the trip in kWh/100km. Average speed in km/h.**

Average speed is calculated in real time and counts stops, a prolonged stop reducing the average speed. This fills the shortcoming of the vehicle which only offers cumulative trip information (no "Trip B" for a single trip). This **display can then be viewed as a single trip** and that of the vehicle relates to the **cumulative trips.** You must drive at least 1 km before the data is displayed. Start of the trip is at the first transition of the vehicle odometer and is shown as the distance 0 km from which the trip is counted in distance and time. Consumption is **computed from energy use.** **For IONIQ 5 and EV6, the car units should be set to km instead of miles for this screen to work.**

### SCREEN 4: HIGH VOLTAGE BATTERY

**Battery voltage in V. Average battery temperature in C. Power** delivered by the battery in kW (positive number in red for discharge, negative number in green for charging or regeneration) **Battery heating temperature** (heater 1) in C. It increases when necessary at fast charging to improve charging and optimize your costs.

### SCREEN 5: 12V AUXILIARY BATTERY

**Auxiliary battery state of charge in %. Auxiliary battery voltage in V. Auxiliary battery current in A** (positive number in red for discharge, negative number in green when charging by the main battery). Note that for IONIQ 5 and EV6 only auxiliary battery voltage is displayed.

### SCREEN 6: BATTERY CELLS VOLTAGES

**Maximum voltage of highest cell in V. Minimum voltage of lowest cell in V. Difference between maximum and minimum cell voltage in V.** The voltage difference should be as small as possible under 0.1 V if the cells of the high voltage battery are well balanced and managed by the vehicle's BMS.