

MAS003876 MCL 24-35

Circular Letter

FROM: Maserati TSO

TO: Maserati Network



Maserati

PERSONAL SERVICE LAB

MASTERS OF CARE

Introduction to Maserati Folgore

DATE: JULY 10 2024

Maserati is an innovative brand by nature, with a unique style fuelled by inexhaustible passion. These values inspired the Maserati brothers almost 109 years ago and are still driving us today to play a leading role on the e-mobility world stage. With a unique blend of tradition and innovation, Maserati is ready to launch Folgore, the new 100% electric range.



Please read and review this bulletin first before ordering parts and/or starting the procedure.

Contact your Regional AfterSales Manager (RAM) or the Technical Support Helpdesk if you have any questions.

Thank You for your continued support and cooperation.

Maserati North America

Aftersales Dept.

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1. Folgore vehicle description

The Maserati Folgore are 100% battery electric vehicles, also known as BEVs. They are powered by the energy stored in the battery, which is used by the electric motors for vehicle propulsion. Differently from an internal combustion engine that burns fossil fuels and produces polluting exhaust gases, the Folgore vehicles are zero-emission. Electric vehicles must be recharged at public charging stations or using a domestic supply network.

Due to the high power delivered by the vehicle systems, the battery is required to operate at high voltage. Understanding the main quantities that define battery propulsion – kW (kilowatt), kWh (kilowatt-hour), and V (voltage) – is important when dealing with BEVs.

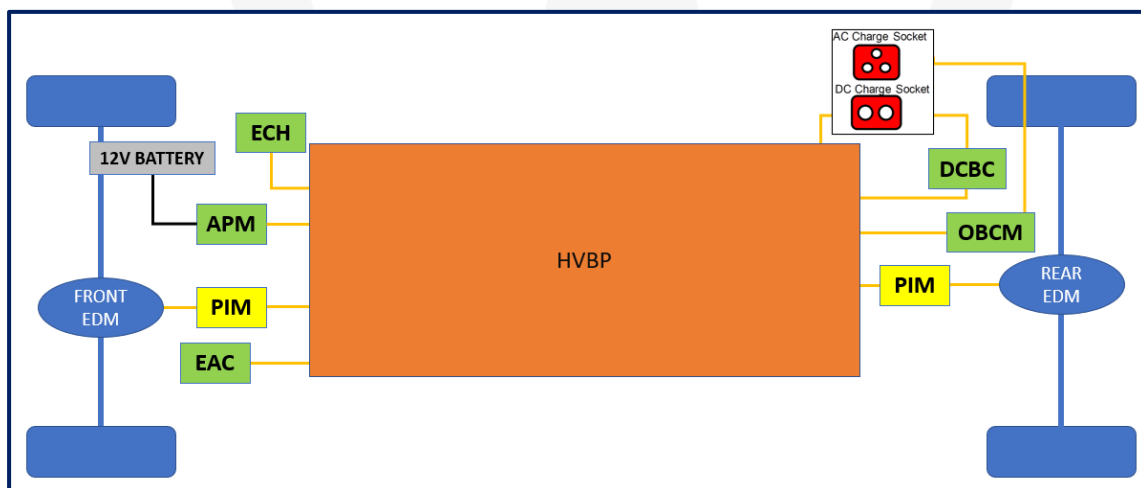
Kilowatts (kW) Is a measure of the power involved during the recharge phase. Every recharging station can deliver a certain amount of power. The more is the power delivered, the less is the time needed for a complete or partial recharge.

Kilowatt-hour (kWh) Expresses the total energy that can be stored in an energy storage system, such as a high-voltage lithium-ion battery, to guarantee a given mileage range, according to the driving style and habits of the customer.

Voltage (V) Refers to the electrical potential of the high-voltage battery. In the automotive high values of voltage are used to obtain high power. High voltage introduces risks for the operators that must be kept under control. The first two Maserati BEV launch models, GranTurismo and Grecale Folgore will have different lithium-ion battery types with different voltages (GranTurismo 800V and Grecale 400V).

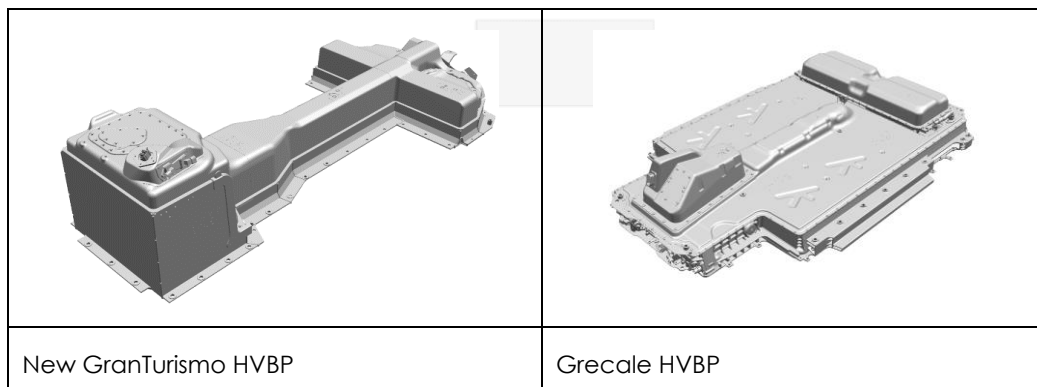
2. High-voltage system overview

An electric vehicle is composed of new devices different from a traditional internal combustion engine vehicle. A schematic overview of the main components of the Folgore vehicles architecture is shown below:

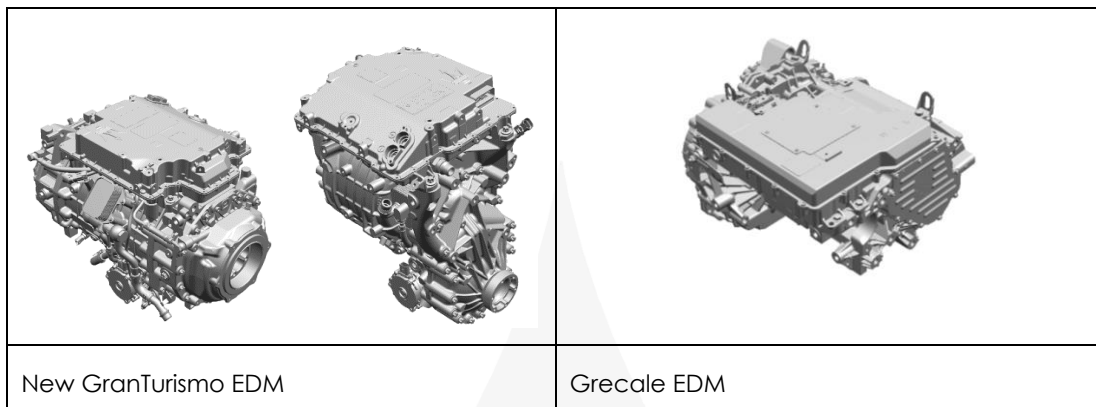


Following a quick description of each component is offered:

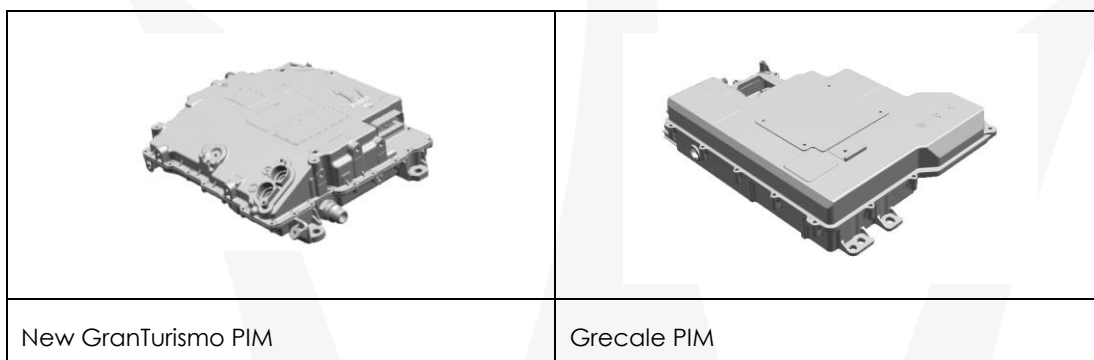
- **Battery (HVBP - High-Voltage Battery Pack):** The traction battery, which is used to store energy and power the propulsion of the battery-electric vehicle (BEV), is the heart of the new Folgore range. The batteries in the Folgore vehicles are capable of reaching high performance in terms of mileage and power.



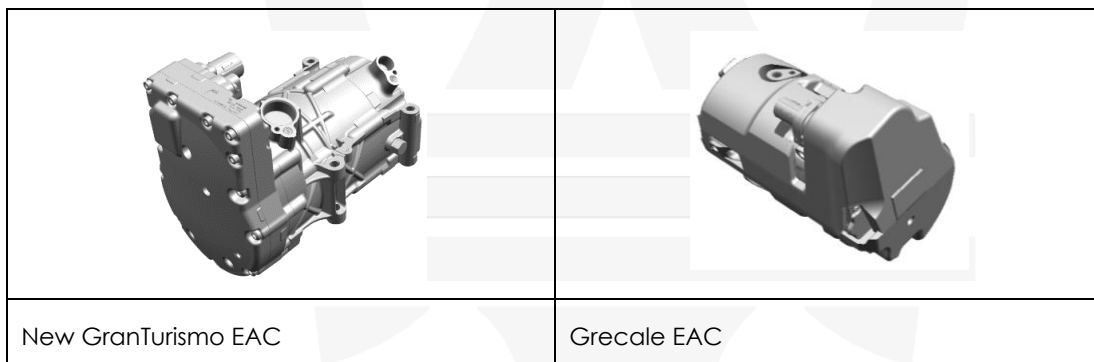
- **Electric Drive Module (EDM):** Electric motors use the energy stored in the battery and transform it into mechanical energy to enable the vehicle to move. Electric motors have much higher efficiencies than internal combustion engines (~80%). Motors are designed to work with three-phase alternating currents, and they can also recover energy during the braking phase.



- **Inverter module (PIM - Power Inverter Module):** Inverters are interposed between the motor and the battery to transform the direct current stored in the battery into an alternating current used for running the EDMs. During braking and deceleration, the PIMs transform the alternating current generated by the motor into a direct current to be stored in the battery.



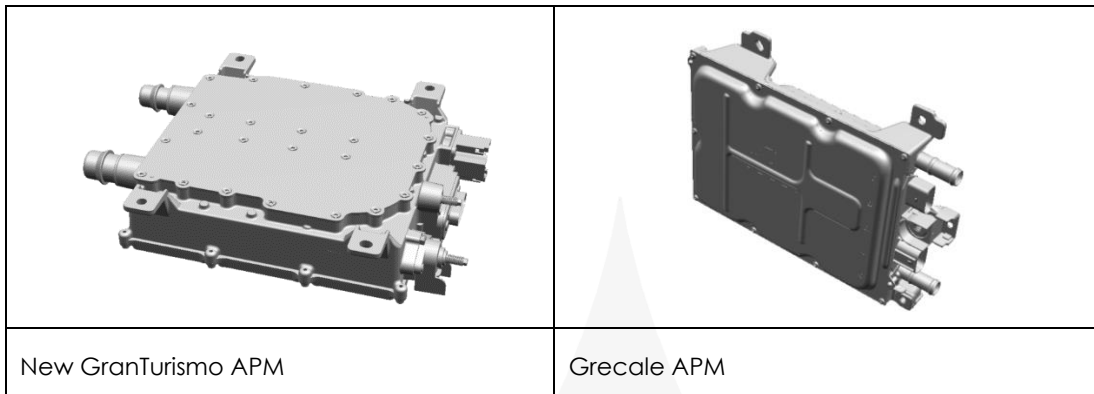
- **Electric A/C Compressor (EAC):** Air conditioning is not only for comfort purposes but it is also used to cool the battery. Rather than being moved by the accessory belt it is powered by an embedded electric motor.



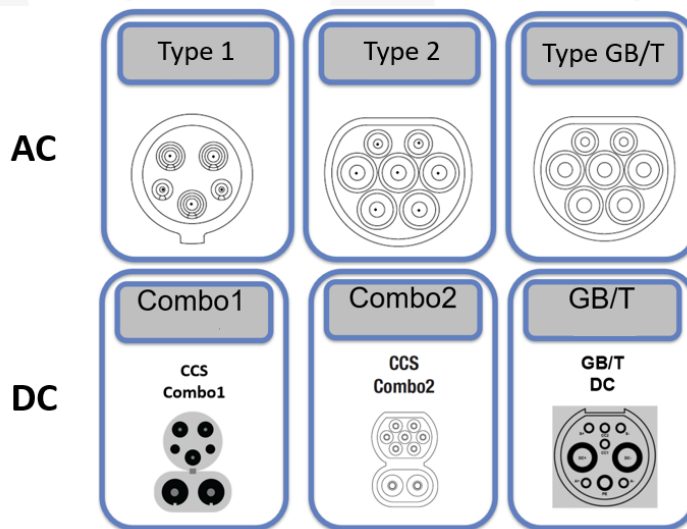
- **Electric Coolant Heater (ECH):** In very cold weather, the electric heater comes into play to heat the passenger compartment and the traction battery. The battery must always be in a well-defined temperature range to operate correctly.



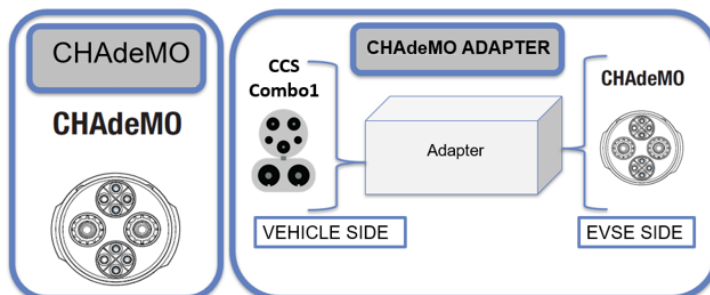
Auxiliary Power Module (APM): Compared to internal combustion engine vehicles on which the alternator charges the 12V battery, on the Folgore vehicles this is performed by the APM that charges the 12V battery by getting energy from the high-voltage battery.



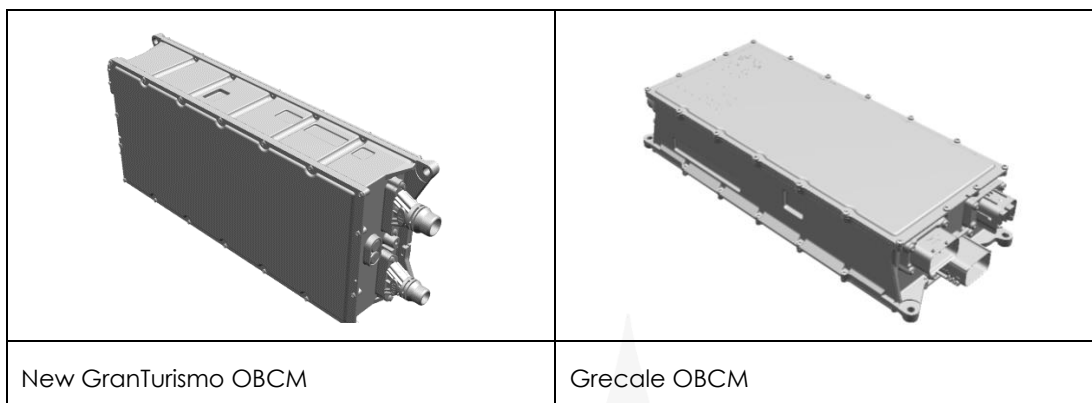
- **Ground Straps:** every high-voltage device in the vehicle is provided with a ground strap that protects operators from possible high-voltage current circulating on the device chassis. Every strap is fastened to the device and the vehicle chassis using screws: when removed during service operations, special attention must be paid during refit installation: the torque prescribed in the Technical Documentation must be used to ensure the proper electrical continuity between the device and the chassis.
- **Charging sockets (AC + DC):** The battery is recharged using an external source of electrical energy, transmitted to the vehicle using a charging cable. The vehicle can be charged at various power values both with AC stations and DC stations. In particular, the Folgore can be charged up to 22 kW in AC and up to 270 kW in DC. A picture of the charging ports in use is shown below:



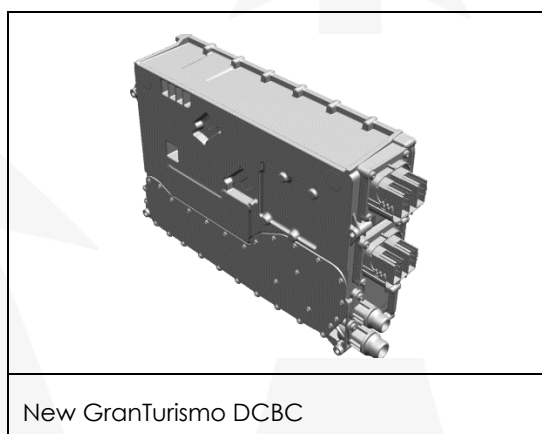
The use of an adapter is required for the Japanese market. It must be interposed between the charging station plug and the charging port of the vehicle.



- **On-Board Charger Module (OBCM):** It is the high-voltage AC/DC converter, it converts AC from the electric grid into high-voltage DC to charge the battery pack. It only works for AC charging.



- DC Booster (DCBC): the DCBC (only for the GranTurismo Folgore) is necessary to step up the voltage of the 400V charging station to 800V as required by the battery system.



- High-voltage electrical wiring: The high-voltage electrical wiring is orange colored to distinguish it from other wiring present in the vehicle.
- 12 V battery: As on conventional internal combustion engine vehicles, the 12 V battery powers all the devices of the vehicle, including the starting, control, and safety systems. The 12V battery is recharged by the high-voltage battery via a periodic charge level monitoring system. The charging strategies of the 12V battery from the high-voltage battery depend on the charge level of the latter. If the charge level of the high-voltage battery falls below a threshold limit, this process will be inhibited and the 12V battery will no longer be charged. In the specific case of a discharged 12V battery that can no longer be recharged via the high-voltage battery, it will no longer be possible to charge the high-voltage battery or even start the vehicle. In this eventuality, an external 12V power source will be needed to start the charging phase and restore normal vehicle functionality.

3. Service requirements

Authorized Maserati workshops will have to meet minimum requirements to be able to deal with Folgore vehicles. An outdoor acceptance area, a quarantine area, and a sufficient workspace for battery handling during service operations are required. Furthermore, personnel must be appropriately trained on the risks of managing high-voltage vehicles and qualified to operate according to the respective local regulations. An overview of the minimum requirements is shown below:

Outdoor Acceptance Area: Folgore vehicles and spare new batteries must be received in an outdoor area, adjacent to the workshop, to run the initial checks on the condition of the vehicle and the HV system. This area ensures that initial inspections of the entire high-voltage system can be carried out safely, preventing risks inside the workshop. Details on the checks to be performed will be published in the Technical Documentation (Modis CS+), and the Whitebook AS Tools will be updated accordingly and can be found in this communication (refer to Chapter 8).

Quarantine Area: In the event of malfunctions or critical damage to the high-voltage battery, the vehicle or the battery must be moved to a dedicated area. The area must be outdoors, provide appropriate shelter for the vehicle/battery from the weathering, and allow to keep the vehicle/battery away from other vehicles, structures, or flammable components (fig. 4.1). Furthermore, the area around the vehicle must be cordoned off with chains and poles. Signs must be put up to indicate that the vehicle/battery is dangerous and access by unauthorized personnel is prohibited. The floor of the quarantine area must prevent any leakage of substances from the battery from being drained by the ground. Refer to the local regulations in force to adapt fire protection systems for managing high-voltage lithium-ion batteries. For more detailed information, refer to the Maserati service guidelines.

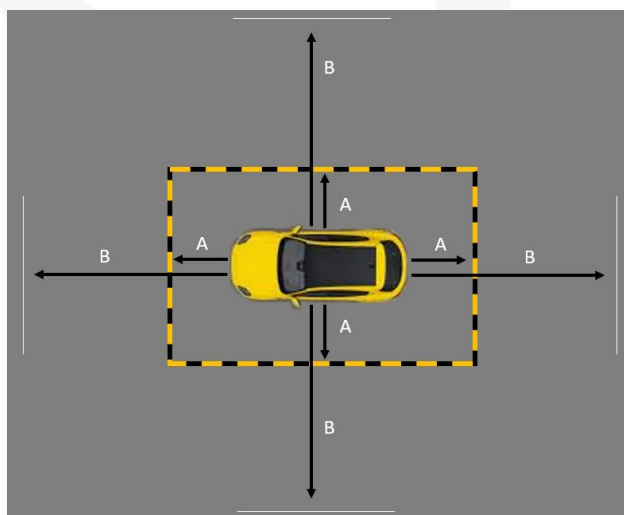


Figure 4.1: A= distance from unauthorised personnel.

B= distance from other vehicles, structures, or flammable components.

Staff training: The following training is mandatory to be able to manage all aspects of the new Folgore Maserati vehicles and to be able to access the Academy training courses.

1. The dealer/employer is responsible for providing occupational safety certification in compliance with local laws to work on battery electric vehicles (BEVs), high-voltage systems, and lithium-ion batteries, and is also a prerequisite for personnel to participate in the Maserati Academy Aftersales training on electric vehicles/lithium-ion batteries.
2. Academic training on electric vehicles is mandatory for the following activities:
 - sales, acceptance, servicing, repair, storage/logistics management of Maserati electric vehicles
 - storage, handling, and securing of Maserati lithium batteries.

Defective batteries that are uninstalled from the vehicle, as explained later in detail, must be returned to Maserati. For dangerous goods (high-voltage batteries) transportation return, the sender must be trained by attending a specific training course, not provided by Maserati, after which a certificate is issued to ensure compliance with transportation regulations (checking package conformity, affixing the mandatory labels and issuing the necessary documents that accompanies the package). The transportation regulations (e.g., ADR or IMDG) also make specific reference to the "loader" and the destination warehouse. The destination warehouse is responsible for unloading the goods at the destination checking that all provisions have been complied with by the sender and reporting anomalies if necessary. The courses are organized by legally qualified certified agencies and a certificate is issued to attendees at the end.

4. Training courses and workshop personnel

Training courses delivered by Maserati Academy to workshop technicians will be specific to Maserati products and will have a particular focus on how to manage vehicles with high-voltage (HV) systems safely. Many countries require specific certification for workers who manage the high-voltage system of battery electric vehicles (BEVs). The employer is always responsible for complying with local law regarding the training and certification of its personnel working on these systems. It is important to note that Maserati, as an OEM, will not provide such training or certification for dealership personnel.

For this reason, starting in 2023, Maserati will identify workshop technicians as follows:

- **EV Specialist:** This label will be added in the HR section in Dealer Intelligence (DI) to identify workshop technicians who are qualified to work on high-voltage systems (active or not) according to the certifications required by local laws provided by the dealership. Each dealership is required to identify at least one workshop technician as an EV Specialist (however, it is recommended to identify two technicians). The identified EV Specialists will be involved in specific training on the management of HV systems on Maserati Folgore vehicles.
- **All other workshop technicians:** Technicians not qualified to work on active high-voltage systems will be involved in technical training on Folgore products. This training program will include a technical presentation of the Folgore product and awareness of the potential safety risks of HV systems but will not include specific operations on active HV systems on Maserati vehicles.

Therefore, to participate in the training courses, it will be necessary to update the HR section on Dealer Intelligence to specify which of your workshop technicians will be EV Specialists and tick the box for training self-certification following local law.

Assigning at least one workshop technician as an EV Specialist is a mandatory requirement for the certification of the E-Mobility standards for Folgore vehicles.

5. Securing the vehicle

The high-voltage system must be disabled to carry out repair work on high-voltage components or work involving possible contact with high-voltage components on Folgore vehicles. In the event of faults and loss of insulation, the high-voltage system exposes people nearby to risks of electrocution and death.

The vehicle de-energizing procedure may only be carried out by authorized personnel, designated by the dealership and appropriately trained according to local legislation and the specific Folgore product training provided by the Maserati Academy (see Chapter 4).

Before starting any work on the vehicle, it is mandatory to read the safety instructions carefully and follow the instructions in the workshop procedures, respecting the provisions on the use of the equipment and appropriate personal protective equipment (PPE).



Verify how to manage these risks following all local health and environmental safety regulations.

The de-energizing procedure involves a series of operations that the EV specialist must certify by filling out a form stating that the vehicle has been secured. The form must be visible and consultable for the duration of the operations on the vehicle.

Similarly, the vehicle recommissioning procedure must be documented using the appropriate form.

The procedure and the related forms to be filled by the technician can be found in the related section of the workshop manual (Technical Documentation).

6. Activation of the Maserati Technical Team

For the launch of the Folgore vehicles, the inter-functional Technical Team has been set up. It consists of personnel belonging to the Product Support, Engineering, Quality, Spare Parts, Customer Care departments, and RAM. The Folgore vehicles will introduce important technical innovations due to the transition to BEV architecture. For this reason, the Technical Team will provide maximum support to the Dealer for correct diagnosis and resolution during the first workshop visit, as well as a rapid and effective investigation of all reported anomalies.

The technical team will carry on for **6** months from the start of sales.

During this time, before carrying out any service intervention related to an alleged quality problem, any anomaly must be reported to Technical Support by opening a Blue on Line report following the Policy in force. Therefore, if no diagnosis support or authorization to proceed under warranty is required, it will be necessary to send at least one report as "Information to the Factory". If opening a report such as "Request for Help" or "Request for authorization under warranty" is not necessary, you can request a refund equal to 0.2 hours of labor time for entering the report as "Information to the factory" by entering the warranty claim of the operation code 0.20.001.A - Information to the Factory 0-3 MIS (0.2 h).

To define the anomaly clearly and allow the Team to respond quickly and effectively, the information requested in the Blue online report (Parameters, Errors, Videos, Images, etc.) must be as complete as possible.

Product Support will coordinate the Team interventions and, in case an on-site diagnosis is needed, they may decide to send a team of specialized technicians to the site.

To allow monitoring of the correct repair progress of the vehicle, the utmost care is required in documenting the status of the Service Entry so that it reflects the actual state of the repair.

With a view to product improvement, and to allow Maserati to improve the diagnostic effectiveness, you will also need to analyze promptly the defective replaced components.

For this purpose, the rules for the management of network returns (**MAS003453**) and if required the Fast Line urgent return process (**MAS003250**) must be applied.

7. Warranty Conditions

Different from what will be indicated for some vehicle components, the HV battery has specific warranty conditions. The general parameters that identify these conditions are time and mileage, as for traditional components; in addition, a certain level of residual capacity is guaranteed, which in general terms must be within a certain threshold. The parameter that expresses this is the SOH-C. Each vehicle will report the specific conditions in the Warranty Booklet. See paragraph 10.2 for additional details on SOH-C behavior and description.

7.1. Circular Economy – Refurbished batteries

According to Maserati policy, batteries requiring warranty replacement, due to functional or safety issues, will be substituted with a new battery or a refurbished battery. If the anomaly cannot be solved in the workshop, batteries subject to failure will follow the Maserati reconditioning and repurposing program. They must therefore be returned to Maserati following the Warranty Return channel. The reconditioned batteries will be used for replacements in service in cases covered by the warranty. The replaced battery will be substituted with a new battery or a battery with the same or higher performance, evaluated now where the failure occurs. The criteria by which a refurbished battery will be used depends on the aging, mileage, and SOH-C of the battery pack.

8. Vehicle and new spare batteries acceptance

In addition to the current process for vehicle check-in, specific checks must be carried out to avoid any risk before entering a vehicle or battery in the workshop. The preliminary checks must be done in the dedicated external check-in area, according to the new Service Guidelines Standards.

Maserati Whitebook will be updated accordingly. below is a list of actions to be taken:

1. Visual inspection for fire.
2. Presence of smoke.
3. Presence of a pungent smell in the battery area.
4. Signs of burning in the high voltage areas are highlighted in the pictures below, with special care in the visible battery parts. If possible, open the hood, side doors, and rear door to assist with the inspection.
5. Checks for severe mechanical damages (even underbody).
6. Connect the EVO to detect the presence of critical errors (see technical documentation)

If no concerns are found, there is no requirement to place the vehicle in quarantine and the vehicle can enter the workshop for normal repairs or further diagnosis.

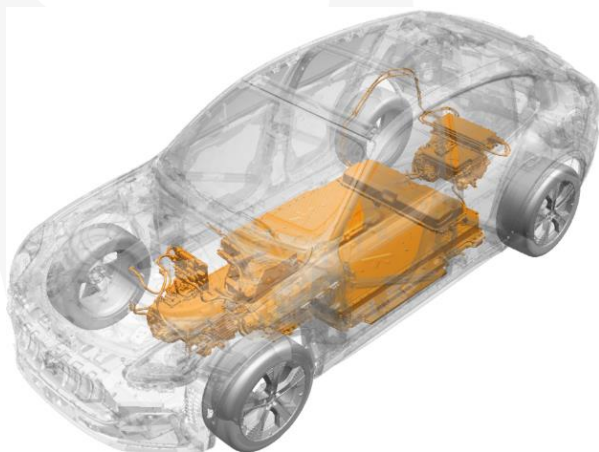


Figure 1 - Grecale High Voltage components

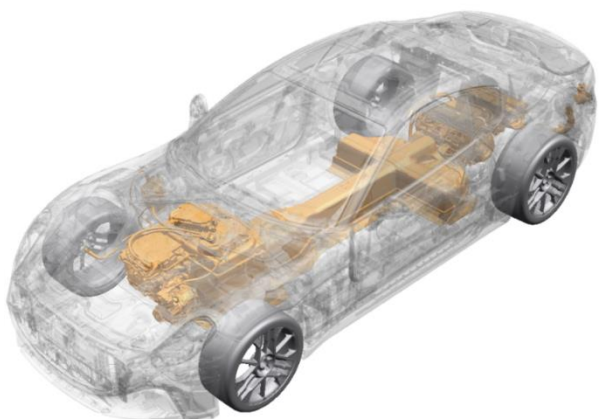



Figure 2 GranTurismo High Voltage components

When receiving a spare new battery, follow the steps from 1 to 6 listed above in the check-in area. It is necessary to open the original wooden box to perform the assessment. No specific form is necessary to be filled. The process described above will be mentioned in the Maserati Whitebook; a specific checklist will be published in the Reception Section of the WHITEBOOK will be issued for the purpose; the anticipation of the checklist can be found below:

Figure 3 – EV Preliminary Checklist for Folgore. The layout can be subject to updates.



Electric Vehicle Preliminary Checklist

Warnings:

- The following checklist is required to allow an electric vehicle to enter the workshop;
- This checklist has to be performed in an external area (check-in area);
- Observe general warning notes for working on the high-voltage vehicles (Observe national requirements and legislation for this work);
- Only appropriately trained and authorized persons are permitted to work on high-voltage vehicles and components;

Follow procedure 08.AA.026 VEHICLE ACCEPTANCE PROCEDURE (EXTERNAL\INTERNAL) to fill out this form.

General information

- Date in _____
- Customer name _____
- Vin _____ • Repair Order Number _____

Checklist

	NO	YES
• Signs of fire	<input type="checkbox"/>	<input type="checkbox"/>
• Presence of smoke	<input type="checkbox"/>	<input type="checkbox"/>
• High voltage components burning signs	<input type="checkbox"/>	<input type="checkbox"/>
• Burning signs inside the hood	<input type="checkbox"/>	<input type="checkbox"/>
• Presence of pungent smell in the battery area	<input type="checkbox"/>	<input type="checkbox"/>
• Severe mechanical damage to the battery case	<input type="checkbox"/>	<input type="checkbox"/>
• Critical DTCs have been detected	<input type="checkbox"/>	<input type="checkbox"/>

DTCs _____

Service Advisor (Name and Signature)

EV Specialist (Name and Signature)

9.1. Safe batteries – regular service operations

In case a normal/regular intervention must be performed on the vehicle that involves a safe battery (see **paragraph 10.5**) and the battery needs to be replaced, the following steps must be taken:

1. Perform the check-in procedure to ensure the battery can enter the workshop.
2. The proper sign (yellow/orange) must be put in on the vehicle to notify that the electric vehicle is not yet de-energized.
3. If the service operation requires the vehicle to be de-energized (procedure can be found in the Technical Documentation), carry out the de-energizing procedure; this task must be performed by a trained person (EV Specialist). A specific module, downloadable in the Technical Documentation, must be signed by the EV Specialist and put within the service documentation (work order) to certify that the vehicle has been de-energized.
4. Once the vehicle is de-energized, all other workshop technicians can perform the service operation.
5. If the service operation requires the battery to be replaced, carry out a classification before shipping the battery.

9.2. Damaged Batteries

If the battery has a failure, or the vehicle suffers an accident, the battery can expose some risk.

below main steps for proper management of the service process are described below:

1. If the battery has been checked in some issue was reported, and fire/smoke events are excluded, put the red sign on the vehicle, to alert personnel that the battery and the vehicle have an issue.
2. Put the vehicle in a quarantine area; follow the prescription of monitoring that is described in the classification checklist (available in the Technical Documentation); this task must be carried out by the EV Specialist.
3. Perform the battery classification and fill in the module available in the Technical Documentation
4. If possible, proceed with the vehicle de-energization; if this task is not possible, the removal of the battery pack must be performed by the EV Specialist, protected by the required Personal Protection Equipment described in Chapter 13, and using the isolated tools described in paragraph 14.1.
5. In case the battery is classified as RED, put a red sign on the battery to highlight possible risks to the operators.

10. High-voltage battery management

10.1. Risks linked to high voltage lithium-ion batteries.

The high-voltage lithium-ion battery during normal operations is generally safe. However, if damaged or if precautions are not taken during certain operations, the battery may be dangerous to the environment as well as to people.

The potential hazards are related to the electrical and chemical threats and the potential cumulative effects:

- **Chemical risks:** The substances contained inside the battery may present some chemical risks due to the corrosive and flammable properties of the electrolyte. Although the battery does not leak during normal conditions of use, it may leak due to accidental causes such as mechanical damage, overpressure, internal fault, etc.
- **Electrical risks:** Damaged high voltage batteries can be exposed to dangers related to electric shock, electric arc, fire, and burns.
- **Cumulative electrical and chemical hazards:** Under certain circumstances, a so-called "thermal run-away" may occur. Basically, in the event of a short circuit, the Joule effect will increase the temperature of the inner components of the battery causing an unstable fire event.

 Verify how to manage these risks following all local health and environmental safety regulations.

10.2. Battery Health and Performance.

Please refer to the instructions in the Owner's Manual of each Folgore model for detailed information on preserving the health and performance of the high-voltage battery. As a general note lithium-ion technology is subject to physiological decay in terms of performance over time. The entity of the decay depends on several factors such as the usage, the charging power, and the environmental conditions. The parameter that summarizes the total performance in terms of deliverable power and residual capacity is the State of Health (SOH), expressed in percentage. The SOH is a calculation made starting from SOH-R (deliverable power) and SOH-C (residual capacity).

Warranty conditions are based on SOH-C value. This parameter depends on various factors at the time of reading including climate conditions (temperature, humidity, etc) or internal temperature of the battery. For this reason, the reading can be subject to a tolerance (+-5%); it is advisable to repeat this reading more than once, in stable environmental conditions.

10.3. Battery maintenance and service

The internal core components of the high-voltage battery are maintenance-free. If there is a malfunction, the batteries are considered "black boxes", meaning internal components cannot be inspected and the entire battery must be replaced. Visual and diagnostic checks provide technicians with guidelines for identifying damaged batteries (see paragraph 10.5).

10.4. Workshop lifts

A specific lift is not necessary to lift a Folgore. However, for some operations like the removal and refit of the battery pack, it is necessary to comply with a set of specifications:

1. The lifts must have no internal obstructions in the area between the two lifting columns (for example, floor cable guides); this allows handling equipment to be displaced properly.
2. The minimum heights of the lift arms including pads must be compatible with the ground clearance of the vehicle.

Below is a chart with the minimum requirements for a 2-column lift:

Minimum requirements for generic 2 Columns Lift				
Load to lift [Kg]	Min distance between columns [mm]	Max height of the arms [mm]	Min height of the liftings pads [mm]	Cables compartment
≥ 3000	2500	112	101	Above / Underground
Best to have: low profile arms; non-protruding arms end; flat rubber pads				

For the Grecale Folgore, specific lifting pads will be required to be able to remove and refit the high-voltage battery. The reason is that with a regular 120/125 mm pad, there could be an interference between the pad itself and the battery. Even with a 60mm cylindric pad, there could be interference between the supporting arm and the battery. In **Figure 4** and **Figure 5**, the quotes of the rear lifting area and the possible contact during the removal phase are represented; the clearance between the battery and the pad is only about 10mm. For the reasons above, new pads have been defined that can work with most lifts shared in the Workshop Catalogue. The availability is summarized in the chart below:

	Special pads for Grecale	Lift compatible with Grecale special pads
Herrmann	900031100	Schwenkarm Lift 2.35
OMCN	900031101	-
Ravaglioli Butler	900031102 900031103	All lifts in the catalog

Rear Pads

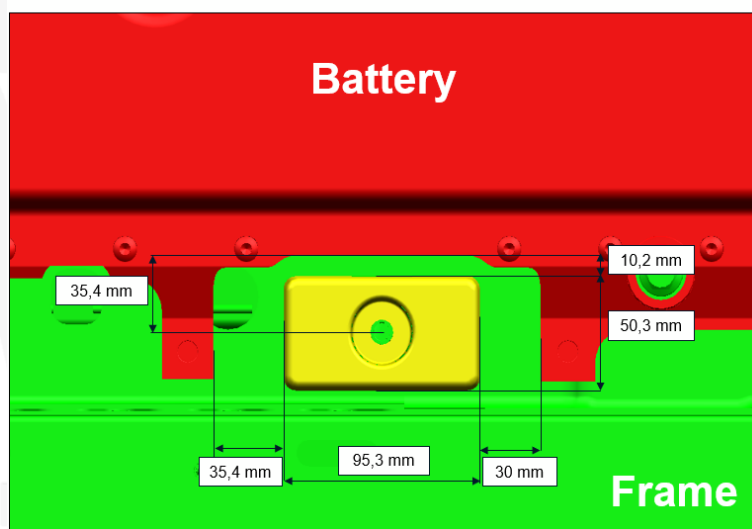


Figure 4 - Quotes of the rear lifting area of M182

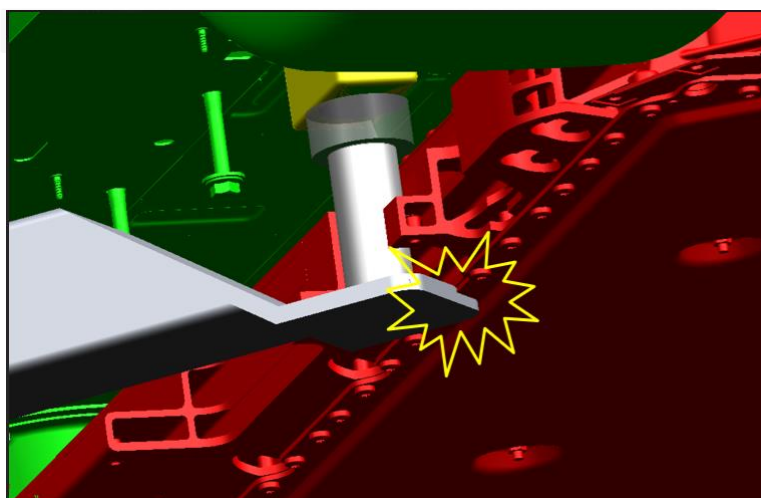


Figure 5 - Interference between the arm and the battery during removal

Dealers that do not have a compatible lift will have to either buy one or independently assess how to meet the required specifications with the current supplier of the equipment.

10.5. Battery classification and replacement

Damaged high-voltage lithium-ion batteries can be exposed to high chemical and electrical hazards. Therefore, before replacing a defective battery, it must undergo a series of checks to assess its state of functionality and safety. Detailed procedures for the classification of the battery can be found in the workshop-specific Technical Documentation for each Folgore model. Checking the conditions of the battery and the high-voltage system is essential to guide the operator in the workshop management of the battery.

The checks required to assess the high-voltage battery can be divided into three categories:

- **Visual checks:** Check for smoke or flames, mechanical damage to the battery casing, connectors, and high-voltage components, and leakage of coolant and electrolyte from the high-voltage battery.
- **Diagnostic checks:** Check the communication with the BMS and the presence in memory of critical errors related to the battery or high-voltage system that can highlight functional and safety issues (insulation losses, damaged fuses, contactor problems, etc.).
- **Voltage and temperature check:** Check that the voltage and temperature parameters of the high-voltage battery system are within the expected range.

The analysis based on this classification checklist will indicate the battery status and how to manage it safely. A summary of how the battery is classified and what guidelines to follow are provided below:

Green ► Safe Battery: The battery does not present any safety risk. It can be handled with suitable equipment without the use of PPE (see Chapter 13) and can be stored temporarily in the workshop.

Yellow ► Unsafe Battery: The battery has damage that compromises its functionality exposing operators and the environment to potential safety hazards. It must be moved into the quarantine area using the appropriate equipment and PPE. If the battery is still in the vehicle, it must not be removed until the parameters and temperature have been properly monitored. Once the quarantine period is over, with the support of the technical team, the removal of the battery from the vehicle can be evaluated, and then shipped to the designated destination (e.g., repair center).

Red ► Risky Battery: The battery has damage that compromises its functionality and safety and exposes it to immediate risks (fire, bursting, etc.). In this case, it is necessary to leave the area immediately and contact the appropriate emergency service (fire brigade, etc.). If the risks are manageable, it may be decided to move the battery with the appropriate PPE to the quarantine area. If the battery is still in the vehicle, it must not be removed until the parameters and temperature have been properly monitored. Once the quarantine period is over, with the support of the technical team, the removal of the battery from the vehicle can be evaluated, and then shipped to the designated destination (e.g., disposal).

High-voltage battery classification is preparatory to battery management for packaging and shipping activities.

In fact, for each type of classification, there is a specific container and management:

Green: If the battery needs to be replaced, e.g., because it has reached the end of its working life, the original container of the new spare battery can be reused to ship the old one.




Yellow: an appropriate container following the international standards for the transport of dangerous goods (Container LP904) must be used for transport operations.

Red: an appropriate container following the international standards for the transport of dangerous goods (Container LP906) must be used for transport operations to a disposal center.

The Dealer can use the appropriate container for green, yellow, and red batteries in these ways:

1. **For Green battery:** the Dealer just needs to open a new spare battery request to also receive the new original container.
2. **For Yellow battery:** The green container has to be used, together with a kit for Yellow batteries return. The KIT must be ordered as an ordinary spare part that can be claimed in warranty.
3. **For Red battery:** A third-party operator will be in charge of recovering and picking up the battery and returning it for repair. In case the battery will have to be disposed of, the disposal channel must be used (see paragraph 10.8).

A summary table with part numbers and a brief description is provided below:

Part Number	Image	Description
N/A		Original new Grecale battery case: to be used for shipping green or yellow batteries (case + kit)
N/A		Original new GranTurismo battery case: to be used for shipping battery classified as green or yellow (case + kit)
90029721		Yellow Grecale Battery Kit: non-combustible Blanket (in accordance with EN13501) and a plastic film. Both are folded around the battery
90029722		Yellow GranTurismo Battery Kit: non-combustible Blanket (in accordance with EN13501) and a plastic film. Both are folded around the battery



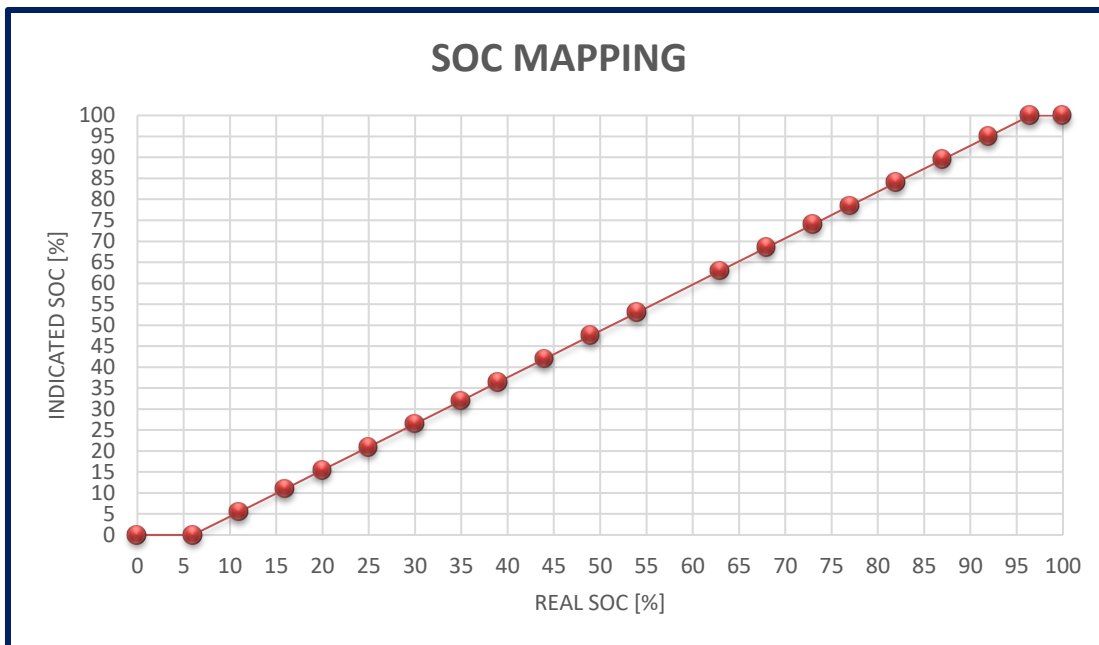
Verify how to manage these risks following all local health and environmental safety regulations.

10.6. Battery management, general handling, and storage

As stated earlier, a new battery must be accepted in a dedicated area where all checks must be carried out to verify its status. Following the checks on the transport box and the high-voltage battery, it will be possible to take the battery into the workshop. The dealer is not allowed to store batteries for more than 3 days. So only temporary storage for logistical or workshop needs is allowed. Should it be necessary or allowed by local infrastructure and regulations to store the battery for longer, the fact that the battery is subject to self-discharge must be considered. If the State Of Charge (SOC) is very low the battery enters a permanent deactivation state and must be replaced and disposed of. Checking the SOC of the batteries stored in the warehouses and mounted on the vehicles in stock is mandatory. Specific instructions on how to manage the electric vehicles in stock will be provided in separate communications.

The SOC indicated in the panel cluster shows a value that is different than the real SOC of the battery. This means that when the instrument panel indicator shows 0%, the real state of the battery is higher, to preserve the integrity of the battery.

The chart below shows the mapping between the real SOC and the indicated SOC is represented:



Batteries are recommended to be stored temporarily in a dedicated area with the following technical and safety requirements:

- Properly marked area accessible only to authorized personnel.
- The room where the batteries are stored must be dry and ventilated.
- The battery must be stored on a flat, electrically insulated surface.
- Avoid temperatures above 60°C and below -30°C.
- Avoid exposure to heat sources and open flames.
- Store the battery at a temperature between +10°C and +30°C with relative humidity between 10% and 65%.
- Store the battery at least 2.5 meters away from other objects/vehicles.
- Do not store in environments where liquids, high temperatures, heat generators, and strong magnetic and electric fields are used.

Values will be detailed in the Material Data Sheet of the battery and may be subject to variations. Please consider the above values as a reference. Material Safety Data Sheet will be issued before vehicle launch.

Finally, to handle the battery within the workshop, special tools will be provided to support the battery on the floor, manage the handling together with the proper packaging, and install or remove the battery from the vehicle (see **paragraph 14.2**)

FORKLIFT: Each workshop must have a forklift available:

- For unsafe battery handling: a minimum load capacity of 2500 kg for handling the high-voltage battery together with the transport case (safety container) is required in the event of an unsafe battery. If no such forklift truck is available in the workshop, each dealership will have to rent/loan or purchase one, in time to deal with arising needs.



Example of a 2500 kg forklift

- For safe battery handling: the total weight of the batteries plus the tools for the handling, and the weight of the batteries plus the wooden packages is below 1000 kg. A suitable forklift truck is required to perform the handling operations. If no such forklift truck is available in the workshop, each dealership will have to rent/loan or purchase one, in time to deal with arising needs.

For vehicle lifting operations and the removal of the high-voltage battery, it will be necessary to have a lift compatible with the Folgore vehicles (see **paragraph 10.4**) and a battery lifter as described in Chapter 14.



Verify how to manage these risks following all local health and environmental safety regulations.

10.7. Warranty claims and battery-related returns Mgmt

As part of the Global Circular Economy, Maserati is committed to repairing high-voltage batteries that present malfunctions or faults which can be resolved by replacing or repairing their components.

Each dealer may open a return request for parts replaced under warranty and follow the instructions for handling network returns set out in Bulletin **MAS003453**.

When returning a high-voltage battery, follow local regulations for the handling of dangerous goods and the instructions provided in the technical documentation.

Furthermore, before starting the return procedure, dealers are required to open a BOL to assess the actual battery condition and have the OK to proceed.

The high-voltage battery management process requires the battery to be returned in all cases, according to the battery classification checklist criteria (see paragraph 10.5).

10.8. Battery disposal

When high-voltage batteries reach the end of their life they must be disposed of and recycled. The high-voltage battery must be properly recycled according to local rules and regulations. Together with Stellantis, Maserati is currently engaging partnerships with locally recognized players able to offer a turn-key recycling service, from the correct battery container supply to the battery pick-up and transportation, until the final recycling activity.

Recycling suppliers will be responsible for:

- a) The battery collection at dealership sites as well as Maserati sites.
- b) Placing the battery into the correct container that they will provide on-site on the day of the pick-up.
- c) Safely placing the battery on the truck for the transportation providing the right tool and equipment to achieve the task (e.g., Truck, cranes, etc).
- d) Transporting the battery from the site to the recycling facility.
- e) Recycling the battery.

Each dealer will be responsible for requesting the intervention of the recycling suppliers, removing the battery from the vehicle, and safely stocking it temporarily until the pick-up (please see also **paragraph 10.5**). Detailed process and information will be shared in a dedicated communication (Recycling supplier contacts and intervention request procedure).

11. Electric Drive Modules management

The EDMs (Electric Drive Modules) of Folgore vehicles (also called E-Axles) are the innovative solution for electric vehicles to combine the electric motor, transmission, and power electronics (Inverter) in a compact system. Generic and special equipment, which each dealer must have, is needed to remove the axles from the vehicle and handle and replace spare parts in the workshop. According to the spare parts management policy, the E-Axle component is considered an assembly under restriction along the whole FEW durations: every intervention on it must be priorly agreed upon and committed to by the Maserati technical team.

12. Management of other high-voltage components

All components of the high-voltage system listed below will be managed as an assembly and cannot be repaired at the dealer. Therefore, the complete component must be replaced in the event of failure.

- Power Inverter Module (PIM)
- Electric A/C Compressor (EAC)
- Electric Coolant Heater (ECH)
- Auxiliary Power Module (APM)
- Charging Sockets (AC + DC)
- On-Board Charger Module (OBCM)
- DC Booster (DCBC – Only for GranTurismo)
- High-voltage electrical wiring










13. High Voltage Personal Protective Equipment (PPE)












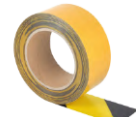
Before starting any work on the vehicle, it is advisable to read the safety instructions carefully and follow the instructions in the workshop procedures, respecting the provisions on the use of appropriate PPE and according to local safety regulations. Before using any PPE, ensure that the manufacturer's specifications are met and check that it is in perfect condition. Failure to observe this precaution can lead to serious or fatal injury.



Verify how to manage these risks following all local health and environmental safety regulations.

The minimum list of mandatory PPE for working on electric vehicles is shown below. It is the responsibility of each dealer to procure PPE indicated in the workshop procedures and comply with local regulations. Business proposals will be shared in a commercial communication for the complete PPE offer availability.

Electric Hazard Protective Equipment		
Description	Image	Note
Insulating glove class 0, 1000V: <ul style="list-style-type: none"> • electrical protection • integrated mechanical protection (no leather glove required) • Arcing protection 		To be used to secure Folgore vehicles or to measure damaged vehicles/batteries.
Protective helmet with visor: <ul style="list-style-type: none"> • electrical protection • Arcing protection 		To be used to secure Folgore vehicles or to measure damaged vehicles/batteries.
Insulating mat		To be used to secure Folgore vehicles or to measure damaged vehicles/batteries.
Coverall		To be used to secure Folgore vehicles or to measure damaged vehicles/batteries.
Pneumatic tester for insulating gloves		This is used to check the integrity of insulating gloves before use.
Telescopic insulating stick		Stick for rescuing a person stuck on a current-carrying conductor. It can be used to move a cable or retrieve a victim to a safe area, for indoor or outdoor use.
Chemical hazard		
Description	Image	Note
Nitrile gloves		Only to be used for damaged batteries that leak electrolyte
Goggles EN166 Scope of use 349 - 5 Mechanical resistance B(T)		Only to be used for damaged batteries that leak electrolyte
Respiratory protection mask according to EN149		Only to be used for damaged batteries that leak electrolyte

Description	Image	Note
General 1000V insulated equipment		To operate on BEVs where it is indicated in the procedures
Digital multimeter/insulation tester (1000V)		For voltage and insulation measurements
High-voltage danger signal (ISO 7010)		To signal high-voltage danger
Prohibition of access for unauthorised personnel (ISO 7010)		To demarcate areas not accessible to unauthorised personnel
Vehicle status signs: Battery/Operating Vehicle		To indicate that the vehicle/battery has the high-voltage system active
Vehicle status signs: Battery/safe vehicle		To indicate that the car/battery has been secured and is safe
Vehicle status signs: Battery/Dangerous Vehicle		To warn that the vehicle/battery is dangerous
Safety posts		To demarcate the vehicle/battery work area
Safety barriers		To demarcate the vehicle/battery work area
Safety padlock		To lock out Manual service disconnect
Electrical hazard magnetic cone		To be placed on the roof of an electric vehicle during service operations
Safety sticker		To demarcate working areas for electric vehicles and batteries

Charging port sticker		To lock the charging door during procedures where it is required
Battery lifter (load capacity 1400 kg)		To move the battery during unloading and placing it on the ground.
Battery lifting adapter		To lift the Grecale high voltage battery with lift truck

14. Tools and equipment

14.1. Generic tools

According to the local regulations and the equipment already available in each workshop, please assess whether to buy a generic set of equipment for handling Folgore vehicles and high-voltage batteries. Maserati offers a partnership with a third-party supplier to get the full range of generic insulated tools and workshop alerts/si; a specific commercial communication will follow to inform about the offer availability.

General Insulated Equipment: One of the possible use cases can be the removal of a high-voltage battery that cannot be de-energized from the vehicle. For this case, a minimum list of generic stand-alone equipment that every dealer must have to operate safely has been defined. The dealer is responsible for procuring the generic insulated tools that comply with local regulations and are indicated in the workshop procedures. However, a commercial communication will inform the Network for the availability of the complete set of the tools by a third-party supplier. The minimum list for Grecale Folgore and GranTurismo Folgore is shown below:

Voltage/insulation meter: the suggested equipment will allow to measure the residual voltage and the insulation features of the batteries versus the vehicle. There could be the possibility that in some country, specific norms about the work on high voltage vehicle could prescribe specific equipment to be used for the scope (e.g. in France, a Voltage Absence Tester – VAT – should be required, even if this equipment does not allow to perform insulation measures). Please always refer to the local regulation to be compliant with the norm.

Insulated accessories	Size
Standard hexagon socket	9mm
	10mm
	13mm
	15mm
	17mm
Long hexagonal bushing	10 mm - length 50 mm
	A= 15 mm
Hexagon head Allen wrench	5mm
	6mm
Socket for TORX screws	T20
	T25
	T30
	T40
	T45
Extension	50 mm
	75 mm
	250mm
RIBE Compass	E12
Wobble extension	11"-279mm
TORX bushing	E10
	E12
Roller spanner	
Generic flat screwdriver	
Clip extraction fork	
Ratchet spanner	

Battery lifting table (battery lifter): For removing and refitting high-voltage batteries, it will be necessary to have a battery lifter with a load capacity of 1400 kg with a perforated top plate compatible with the special equipment provided as an interface to support the batteries of the various Folgore models. For the use of battery lifters other than the one suggested by Maserati, the dealer is responsible for checking compatibility with the technical specifications and special dedicated equipment. Refer to the dedicated commercial communication for the suggested battery lifter validated by Maserati for battery removal and refitting operations.

Battery lifting adapter for the forklift: this generic tool must be used in conjunction with the dedicated special tool (see **paragraph 14.2**) to lift the Grecale high voltage battery with a forklift truck. This tool affixes securely to a single forklift, moving the load safely. Each dealership must have a fork adapter with load capacity according to the weight of the Grecale battery. A version validated by Maserati of the fork adapter will soon be available in the workshop equipment catalog.

14.2. Special tools

Maserati has defined and developed special tools dedicated to Folgore to get ready for the complete service and diagnostic of the vehicles. The lists below show all the tools already defined and dedicated to Folgore vehicles. The first chart reports the priority mandatory tools list that will be shipped starting from the end of June, according to the launch plan of the products for each market area; the second chart reports the tools that will be shipped in further batches to allow workshop warehouse area optimization.

SPECIAL TOOLS					
Part Numbers	Short description – name	Weight (kg)	Size (mm)	Applicability	
				GranTurismo	Grecale
900001694	HVB handling spider	65,5	2352,5 x 1270 x 527,5	X	
900001695	HVB Ground support tray	34	2371 x 1180 x 70,2	X	
900001693	HVB lifter tray interface	120	2380 x 1270 x 162	X	
900030927	HVB lifting equipment	6,5	400 x 300 x 200 (BOX)		X
900001696	HVB lifter rod interfaces	4,5	154.5 x 480 (x2) 140 x 480 (x2)		X
900001697	HVB Ground support equipment	1	∅ 27,7 x 129,5 (x6)		X
900031096	Centering pin for inverter positioning on EDM	0,06	∅ 8 x 70 (x2)		X
900030836	Rear axle removal equipment	8	420 x 280 x 110 (BOX)	X	
900030918	Front axle removal equipment	8,6	740 x 200 x 250 (BOX)	X	
900030925	Rear axle removal equipment	14,7	740 x 200 x 250 (BOX)		X
900030924	Front axle removal equipment	9,5	740 x 200 x 250 (BOX)		X
900031019	Front/rear axle bench support brackets	2,5	211 x 371 x 20		X
900031018	Front axle bench support bracket	8	450x250x15	X	
900031017	Rear axle bench support bracket	1,5	450x250x130	X	
900031014	Front motor centering brackets	5	610 x 270 x 100 (BOX)	X	
900031015	Front axle lifting equipment	2	200 x 150 x 200 (BOX)	X	
900031016	Rear axle lifting equipment	15	490 x 430 x 290	X	
900030922	Adapters for coolant circuits drain	3	400 x 380 x 110 (BOX)	X	X
900031097	Insertion guide for front/rear axle seal	1	∅ 100 x 500	X	
900100007	Breakout box for high-voltage system voltage and insulation measurements	2	400 x 300 x 200	X	X
900031020+ 900031127	Battery pack and battery cooling circuit leak tester and plugs additional kit	4	420 x 380 x 120	X	X
900030810	Cable for HV battery off-board diagnosis	1	Length = 400	X	X
900031123	Differential Oil seal installation tool	0,5	∅72 x 171		X
900100011	Driving tool for front subframe M189 BEV	7	600 x 300 x 400	X	
900030923	BEV centering columns	2,5	∅ 100 x 800	X	X