



EMERGENCYPLUG®



**Quickly create a safe working environment
for first responders working on any type of
Full and Hybrid Electric Vehicles.**

IMAGINE THIS.... An electric vehicle is involved in an accident and the automatic gearbox is still in Drive (D) or Reverse (R). A first responder won't know if the EV is still switched-on. And the driver could still step on the accelerator and set the car in motion. Result: the EV could drive off without any warning. The effects could be devastating...



SAVING TIME... It takes a lot of time to create a safe working environment including disabling the Electric Vehicle. Using the Emergency Plug® (Plug) this can be reduced to seconds.

Research shows that unexpected vehicle movement is one of the main dangers when Plug-in Hybrid or Full Electric vehicles are involved in an accident.



WHAT MAKES AN ACCIDENT WITH EVs MORE DANGEROUS??

Unlike petrol cars, an Electric Vehicle (EV) does not switch-off once the clutch is released. Moreover, you can't hear the engine running. The engine of an electrical car will only shut-off if the impact is powerful enough and the safety systems are fully operational. First responders are generally not in a position to check if the EV is indeed switched-off. They also don't have the technical knowledge necessary to check if all the security systems have worked properly.

Due to advances in technology, some EVs are equipped with a system that activates the car once the driver is seated behind the wheel. Some Full EVs can be started without a key. They might be started by a mobile phone, a card, or even by pressing

the Start/Stop button, for example. Situations like these make it very difficult for first responders to anticipate and respond quickly to the needs of the victims while taking their own safety into account at the same time.

Moreover, the victim could unconsciously or unwittingly step on the accelerator while the engine is still running. The EV will immediately respond without any warning. Since electrical cars are equipped with a large torque from zero, it is impossible to block the wheels. In fact, blocking the wheels could create an even more dangerous situation, as this could 'launch' the car, creating a potentially highly dangerous situation for first responders, the victim(s) and any bystanders.

The Emergency Plug®

The Emergency Plug® (Plug) has been developed to prevent unpredictable vehicle movement by any Full or Hybrid Electric Vehicles (EVs) in an emergency situation as well as during regular maintenance.

Even though every Plug requires different signals, our Plug simulates the different charging protocols of each EV, we are able to guarantee the Plug's suitability for 100% of all EVs that comply with the safety protocols of the UN ECE R100 regulation. By providing continuous visual feedback from the Plug about whether the EV is still able to drive away or not, we can ensure the safety of users throughout the emergency situation or during the entire maintenance procedure. Quickly creating and maintaining a safe working environment.



- PREVENTS AN EV FROM DRIVING AWAY UNDER ITS OWN PROPULSION
- GIVES COLOUR FEEDBACK INDICATING THAT THE PLUG IS WORKING AND HAS CONNECTION WITH THE EV
- NO CONTACT WITH HIGH VOLTAGE
- ELIMINATES OR SIGNIFICANTLY REDUCES THE TIME SPENT IN A DANGEROUS WORKING ENVIRONMENT!
- UNIVERSAL, FITS IN EVERY SOCKET - WORLDWIDE
- CAN BE PLUGGED IN AND UNPLUGGED AT ANY TIME
- ALL ELECTRIC SYSTEMS STAY OPERATIONAL, SUCH AS: WINDOWS, SEATS AND LIGHTS
- FOR USE IN LIGHT CARS, HEAVY TRUCKS AND BUSES
- FOR ALL FIRST RESPONDERS AND TECHNICIANS



COLOURS IDENTIFIERS

Self-test to turn flashing green

Every time the Plug is switched-on, it carries out a self-test, flashing red, green, blue and yellow to check it is fully working. When the test has been completed, the Plug flashes green constantly and is ready for use.

Constantly blue, when inserted

MEANS: The Plug is connected to the charging port and has contact with the EV. The EV is in its charging safety mode and cannot be moved under its own propulsion.

EXPLANATION: Safety procedures differ between different types of EVs. When the Plug is inserted, most put the gear into 'Neutral' or 'Park' mode. Some also activate the handbrake. Some older types of EVs may have other safety protocols, such as disabling the accelerator.

ACTION: Block the wheels, to prevent the EV from rolling, for example on a sloped surface. This is important if the brake is not activated. In addition, you should continue to follow your own safety protocols.

Flashing green, when inserted

MEANS: The Plug is connected to the charging port but has no contact with the EV. The Plug is, therefore, unable to prevent any unpredictable vehicle movement.

EXPLANATION: The EV somehow is not responding to the Plug as contact cannot be made between the Plug and the EV. There is no connection between Proximity Pilot (PP) and the Communication Pilot (CP). Possible causes could be:

- 1 The airbags have been deployed and the interlock has probably been successfully activated (see below for details).
- 2 One of the cables from the charging port is severely damaged.

ACTION: Leave the Plug inserted, in case the condition of the EV changes and does detect the Plug after all. Carefully visually check if the power has been shut-down and if the EV is no longer in Drive (D) or Reverse (R) mode. Follow your own safety protocols and any local rules and regulations.

IF IT'S BLUE IT'S SAFE FOR YOU



Flashing yellow, when inserted

MEANS: The Plug is connected to the charging port and has limited contact with the EV.

The Plug may work, however in order to guarantee 100% functionality, the Plug requires both the PP and the CP signals.

Only then will the light be blue.

EXPLANATION: There is only contact with either the PP or the CP. Possible reasons could be:

- 1 One of the cables from the charging port is severely damaged.
- 2 The interlock has deactivated only 1 signal: the PP or CP.

ACTION: Carefully visually check if the EV is no longer in Drive (D) or Reverse (R) mode and follow your own safety protocols.

Flashing red, when inserted

MEANS: The Plug previously had some or full contact with the EV (it was either blue or yellow), but now lost contact completely (both the PP and CP signal).

EXPLANATION: Possible reasons could be:

- 1 Connection was lost during safety work being carried out on the EV.

2 The Plug has accidentally been unlocked from its charging port: human error.

ACTION: Check that the Plug is correctly connected to the EV. Switch the Plug off and on again before reinserting it into the charging port. Check if the EV is switched off according to its own safety protocol. Remove the Plug entirely and continue to follow your own safety protocols.

Flashing orange briefly

The Plug can be switched off by pushing the button until it briefly flashes orange. Now it can be stored safely.

Constantly blue with flashing red, when inserted

MEANS: When part of the blue light starts flashing red, the car detects that there is an increased risk of the battery pack overheating (IEC 61851-1 regulation).

The car remains immobilised.

EXPLANATION: If the temperature of the battery pack becomes too high, it can lead to a shorter lifespan, damage or even more dangerous situations, such as a thermal runaway. That's why the vehicle always measures temperature and will cool when necessary. The Plug detects the behavior of the car.

For details of other colour indicators, consult the user manual.



DRIVE AWAY / RESTARTING

After removing the Plug you can simply start the EV by pushing the Start/Stop button and putting the gear back into Drive (D) or Reverse (R).

WHY YOU SHOULD **NOT USE** A STANDARD LOOSE, UNCONNECTED CHARGING PLUG

- EVs react to different signals that can only be given by the Emergency Plug®. The Plug gives both active PP and CP communications. A standard plug does not include CP communication.
- A standard plug cannot carry out a self-test. So, you can't be sure it is not damaged. Even though it may still give a PP signal.
- There is no visual confirmation on a standard plug to let the user know that it is working correctly. This is particularly important if the EV could be damaged. The Plug uses different colour codes to inform the user that it is working correctly at all times.



- With the Plug there is no risk of electrocution as it makes no contact with the High Voltage Supply. The risk in the case of standard plugs is further increased as some EVs have a bidirectional charging option.
- There are many different types of EVs. The Plug is universal and can always be used.
- It is not always possible to insert a standard plug when an EV is switched-on. This is not an issue with the Plug as it has no locking mechanism.
- It is not always possible to remove a standard plug after use due to the locking pins. This is not an issue with the Plug.

CONCLUSION

A standard charging plug is not suitable for preventing unpredictable vehicle behaviour and/or unpredictable vehicle movement.

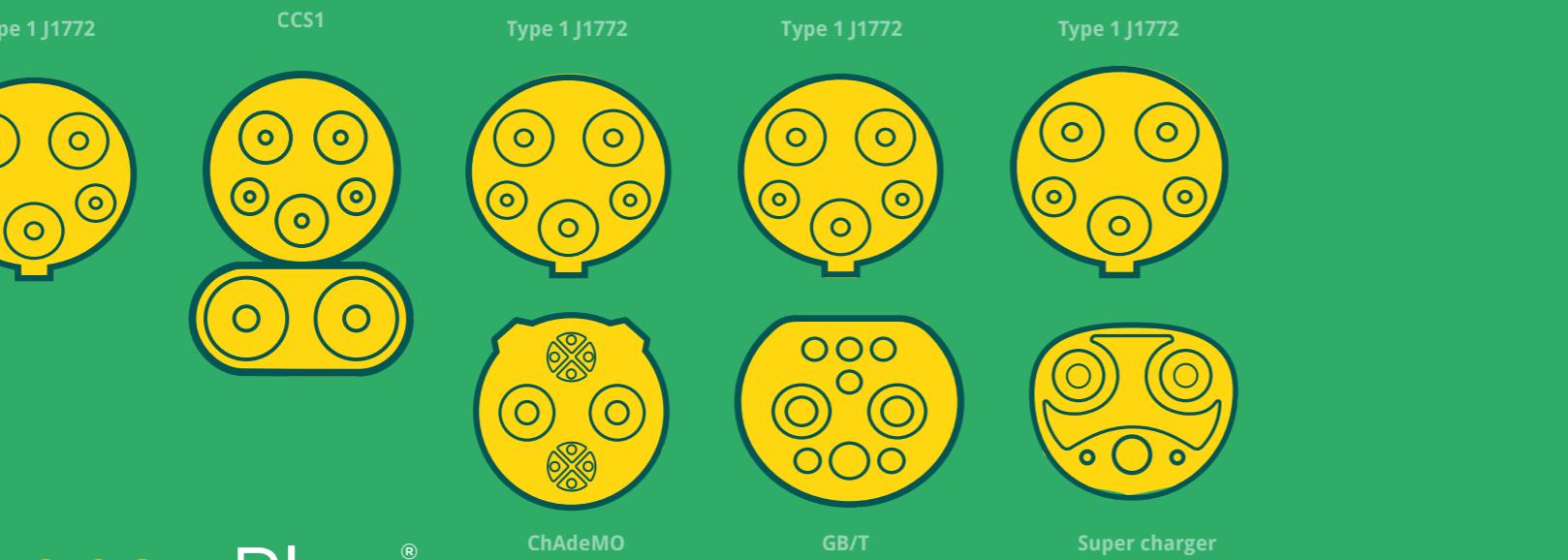


Our local distributor can provide an annual service, carrying out several tests and calibration. Alternatively, the Plug Service Suitcase enables you to carry out your own service via our Plug portal.

MAINTENANCE & SERVICE

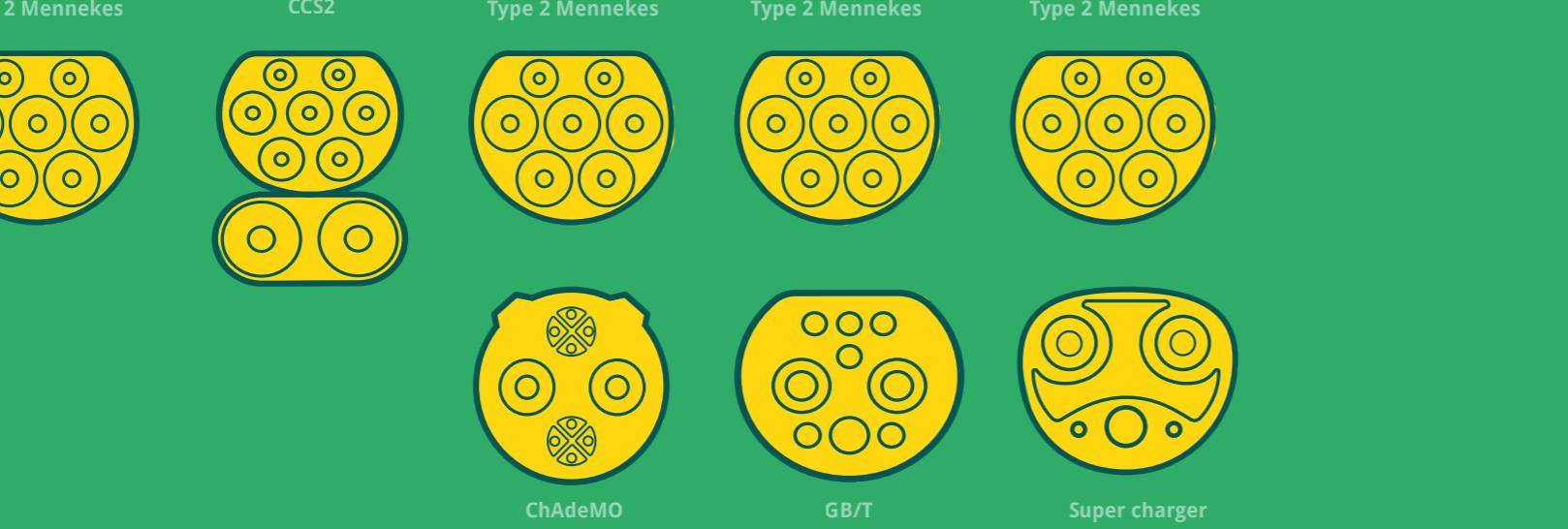
FREE FIRMWARE UPDATES AND EXTRA WARRANTY

After registering your Plug on the **service portal** of our website, you will receive an extra year's warranty, giving a total of two years. This includes the possibility to update **new firmware for free**, if needed. Ensuring you can use your Plug for many years to come.



The Emergency Plug®

Thanks to its unique 2-sided design, the Emergency Plug® is suitable for use on all EVs.



R100 REGULATION

"If a battery can be externally charged by the user, vehicle movement by its own propulsion system shall be impossible as long as the connector of the external electric power supply is physically connected to the vehicle inlet"

The Automotive industry has developed several types of safety solutions in response to the R100 regulations. The Plug is capable of activating each safety protocol, ensuring the safety of first responders. Some EVs may activate their safety protocol when a standard charging plug is inserted. However, the user has no continuous visual confirmation of this. Moreover, this type of activation is mainly used in older EV types and is becoming less common.

EXPLANATION PP AND CP

The **Proximity Pilot (PP)** pin on Plug Type 2 tells the EV the type of cable that is connected to the socket – different cable thicknesses can cope with different amounts of electrical current. On Type 1 it can be used to indicate that the plug will be removed shortly.

The **Control Pilot (CP)** pin provides bi-directional communications between the EV and the charging system. This checks the maximum amount of current that the EV is able to take at any one time.

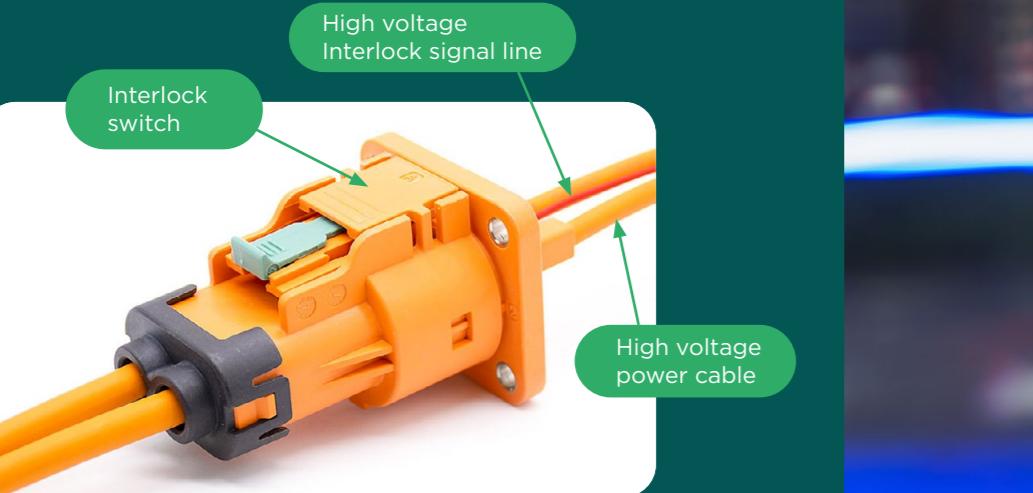
The Plug recognises and communicates the desired PP and CP signal to activate the EV's safety protocol. This is different for each EV.

INTERLOCK

An interlock (HVIL) is a safety feature of EVs that protects individuals during the assembly, repair, maintenance and operation of an EV as well as in the event of an accident. This includes when the airbags have been deployed, or if the first responder loop has been cut.

However, even when the HVIL should have been deployed, it cannot always be relied upon it. The reasons for this are:

- There is no external indication that the interlock is properly activated.
- It is a mechanical system that is prone to failures and may even become welded together during an accident.
- There are several situations when it might not be deployed, for example if the EV is not severely damaged or the airbags have not been deployed due to mechanical failure.



FAQ

DOES THE EMERGENCY PLUG® SWITCHES OFF THE HIGH VOLTAGE AND MAIN POWER?

No the Plug does not switch off the high voltage and main power, i.e. it does not 'isolate' the EV. This means all the electric options, such as windows, Seats, lights of the EV car will be used.

DOES THE EMERGENCY PLUG® ACTIVATE THE PARKING BRAKE OF THE VEHICLE?

Not always. The R100 regulation obliges an EV manufacturer to ensure that the EV will not drive away under its own propulsion. Each EV manufacturer is free to find a suitable solution to prevent this from happening.

DOES THE EMERGENCY PLUG® ALWAYS CHANGE THE AUTOMATIC GEARBOX TO 'PARK' MODE?

Not always. The R100 regulation obliges an EV manufacturer to ensure that the EV will not drive away under its own propulsion. Each EV manufacturer is free to find a suitable solution to prevent this from happening.

WHAT SHOULD I DO IF THE RED LIGHT STARTS FLASHING ALONGSIDE THE BLUE SIGNAL (H3 GENERATION)?

When the red light flashes, it means that the vehicle is reporting an **excessively high battery temperature**. Normally, the car cools the battery pack. Depending on the situation, **take preventive measures** in case the car can no longer handle this cooling due to physical damage to the car and/or battery pack.



If you would like to know more about the Emergency Plug®, or are interested in a demonstration, please contact us on +31(0)13-822 14 80 or email us: info@totalsafetysolutions.nl



Your dealer: