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ACEA position and recommendations for the standardization of the charging of electrically chargeable vehicles

Having in mind the significant role of electrically chargeable vehicles in the future development of clean and energy efficient cars, ACEA members would like to contribute actively to create favorable conditions for further development of this sector. The industry is aware of the fact that one of the most critical prerequisite for successful deployment of the electrically chargeable vehicles on the European internal market is the sphere of standardization and interface between the cars and infrastructure.

Therefore ACEA welcomes the initiatives taken by the European Commission, the European Council and CEN/CENELEC to proceed as quickly as possible with defining standards concerning the charging interface. It will facilitate the further market uptake of electrically chargeable vehicles and could speed-up several pilot projects that are in the pipeline today.

ACEA members present the first part of a joint recommendation on interface between cars and relevant infrastructure, keeping in mind different consumer and societal needs. These recommendations should result in maximum interoperability within EU Member States and highest safety for consumers. We also believe this agreement and recommendations could form a good basis for global standards. The agreement covers at current stage widely-used and ready-to-use infrastructure both on the side of the car and on the side of public and private infrastructures. This first part only covers 1 and 3-phase AC charging in short and medium-term perspective and reflects the needs of passenger cars and light-commercial vehicles. Further agreements will follow for long term, DC charging and heavy-duty vehicles.

However, it is important to note, that the current joint position and recommendation is based on today's best knowledge of the current situation and state of technical development. Certain technical solutions may still need to be validated in detail, as the technical specifications have not yet been finalized in the different International Standardization Groups. This agreement provides the firm willingness of automotive manufacturers to come ultimately to one standardized solution for the charging of electric vehicles. It provides from today's perspective long-term guidance. Of course, it might be revised if the validation of current solutions is negative and/or if better technical solutions are developed in the coming years. In this context, we strongly support the European Commission's upcoming electro-mobility demonstration project (FP7 – Green Cars Initiative) which will test and validate the different technical solutions and standards. The learnings and outcomes of such a demonstration project could eventually result in a set of different recommendations.

ACEA members call upon the European Commission, relevant standardization bodies and other stakeholders to support this recommendation and use it as a basis for the development of common European standards. Recommendations were prepared jointly with Japanese and Koreans manufacturers and they are invited to join this initiative.

Annex: ACEA position and recommendations on connector types (IEC 62196) and charge modes (IEC 61851) for the charging of electrically chargeable vehicles (passenger cars and light-commercial vehicles)

Executive summary:

- ACEA recommends dividing the timeframe into two fundamental phases - Ongoing period till approval of relevant standards (Phase 1) and approval of relevant standards with sufficient lead-time for implementation (Phase 2). Standards for DC charging to be developed and agreed on in coming months.
- Current agreement covers Phase 1 and partially phase 2 for passenger and light-commercial vehicles only, further recommendations will follow as well as for long term, DC charging, charging electrically chargeable heavy duty vehicles.
- Phase 1 reflects current situation and should be seen as a preparatory step for a broader introduction of electrically chargeable vehicles in the EU. Public authorities are welcomed to consider the voluntary agreement made by the industry and pilot projects in urban areas should be streamlined on the infrastructure side accordingly.
- Phase 2 suggests, on the one hand, uniform EU solution that reduces the variety of solutions in the market, and on the other hand, maximum flexibility for consumers and predictability for producers.
- Harmonized rules for phase 2 will apply for new vehicle types starting 2017, so to provide the industry with enough lead time to implement these new solutions in their vehicle development programs and to make necessary adaptation in the infrastructure.

Phase 1:

ACEA agreement for the vehicle inlet:

No restrictions on type of vehicle inlet as vehicles with different types are already on the market or in a late development phase. Manufactures will provide at least one cable with Type 2 plug (Mode 3) or standard domestic plug (Mode 2) to connect to infrastructure.

ACEA recommendation for public charging (infrastructure side):

Type 2 (Mode 3)

Remark 1: Industrial sockets (IEC 60309-2 – Mode 2) should be allowed for this transitional period.

Remark 2: As vehicles from Phase 1 product launches will be equipped with different kinds of vehicle inlets, it is important that all public charge spots which use attached cables have an additional Type 2 infrastructure socket outlet. If the vehicle inlet is of a different type than the connector on the fixed cable, the customer must be able to use its own cable delivered with the vehicle. (Any adaptors on the vehicle side are forbidden by IEC 61851 due to safety concerns).

ACEA recommendation for home charging (infrastructure side):

Type 2 (Mode 3), standard home socket outlet (Mode 2) or industrial socket (IEC 60309-2 - Mode 2).

Remark: Standard home sockets are widely available and well known to customers making them easy to use; therefore they should remain a valid solution for the market uptake. However, a third party certification of the household electricity grid should be conducted before the electrically chargeable vehicle is first charged.

Phase 2:

General remark: Certain technical solutions still need to be validated in detail, as the technical specifications have not yet been finalized in the different International Standardization Groups. In this context, we strongly support the European Commission's upcoming electro-mobility demonstration project (FP7 – Green Cars Initiative) which will test and validate the different technical solutions and standards (different Mode charging and different Type plugs). The learnings and outcomes of such a demonstration project could eventually result in a set of different recommendations

ACEA agreement for the vehicle inlet:

Harmonized solution, using Mode 3 charging, will apply for new types starting 2017.

ACEA recommendation for public charging (infrastructure side):

Mode 3 uniform EU solution (Type plugs specifications to be finalized by the end of 2010 in conjunction with the CEN/CENELEC activities, having in mind global context).

ACEA recommendation for home charging (infrastructure side):

Mode 3 uniform EU solution (Type plugs specifications to be finalized by the end of 2010 in conjunction with the CEN/CENELEC activities, having in mind global context).

Remark: Standard domestic sockets or industrial sockets (Mode 2) should still be allowed on condition of third party certification of the household electricity grid to be conducted before the electrically chargeable vehicle is first charged.

Justification:

Currently different connectors are proposed for electric vehicle charging in Europe (IEC 62196-2 Type 1, Type 2 and Type 3). Only Type 2 and Type 3 connectors can be used for single and three phase charging, which is essential for a region with three phase distribution grids and household service connections which can be single or three phase like Europe. Countries like Japan and the USA where three phases are not as readily available as in Europe decided to use a pure single phase connector (IEC 62196-2 Type 1). China has got similar distribution grids as Europe and therefore includes in the new standard the IEC 62196-2 Type 2 connector for the vehicle and the infrastructure. The main differences between the two universal 1 and 3 phase connectors are maximum current and the use of shutters:

IEC 62196-2 Type 2

All Type 2 two accessories (socket outlets, plugs, vehicle connectors and vehicle inlets) are constructed that they meet IPXXB (finger protection). The use of shutters is on Type 2 accessories is not mandatory as plugs / socket outlets must be only used in Mode 3 all contacts of the charging accessories are de-energized if the accessories are unmated or the earth wire continuity check failed.

IEC 62196-2 Type 3

All Type 3 accessories have to be equipped with mechanical shutters. Type3 vehicle connectors and vehicle inlets can be used safely in Mode 1 (permanent power, no earth wire continuity check).

Installation rules in some European countries require shutters on standard domestic sockets to reduce the risk of electric shock, especially for children. Mechanical shutters have been the only option to upgrade existing plug and sockets system without loosing backward compatibility. As vehicle charging sockets will also be used in areas accessible to children, OEMs strongly believe that their safety level must be equivalent or even higher to the safety level of domestic sockets. Shutters, however, have some inherent weaknesses that must be eliminated when defining a totally new system for vehicle charging:

- Proper operation of mechanical shutters can not be guaranteed in harsh outdoor environments (dirt, humidity, heat and freezing temperatures can block shutters in closed or open position)
- A malfunction of a shutter can not be readily detected (a shutter blocked in open position may be remain undiscovered for a long time)

- Shutters can be easily manipulated (insertion of two objects at the same time to disengage shutter)

When applying Mode 3 Charging, socket outlets can only be energized if all of the following requirements are met:

- Infrastructure Plug is fully inserted into the socket outlet (pilot control pin is last in contact sequence)
- Vehicle connector is fully inserted into the vehicle inlet (pilot control pin is last in contact sequence)
- The continuity of the earth wire has been checked (pilot control signal)
- Plug and vehicle connector are locked by a mechanical or electromechanical locking mechanism
- Vehicle has transmitted a defined signal to the charge spot that all safety conditions have been fulfilled and it is ready to charge

This means that even if a person was able to touch a contact of an unmated socket outlet or vehicle connector, there is no risk of electric shock. Even in a mated condition, Mode 3 disconnects the vehicle from the grid in case of any fault detected by the vehicle or the charge spot. A mechanical shutter may add some safety in unmated condition, but can not improve safety in mated condition. The proper de-energization can be guaranteed by the use of highly reliable components, monitoring and signaling of malfunctions as well as redundancy levels. EN 61508 defines the safety level that has to be reached and the measure to be taken.

Combining the mechanical protection of shutters with Mode 3, which is already developed with many redundant safety levels, would reduce reliability without any safety benefit. This is primarily due to the harsh outdoor environments in which EV plugs and sockets will operate, for which mechanical shutters are not suitable. For this reason the single phase connector which will be used for example in the USA and Japan has been designed without shutters. China will use most probably the IEC 62196-2 Type 2 in mode 3 connector without shutters as well. Therefore ACEA believes Mode 3 provides superior protection compared to shutters.