CEN-CENELEC

WORKSHOP

AGREEMENT

CWA 16688

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English version

Battery Swap Systems Interfaces for Electric Vehicles

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Foreword

This CEN-CENELEC Workshop Agreement has been drafted and approved by a Workshop of representatives of interested parties on 2013-07-03, the constitution of which was supported by CEN-CENELEC following the public call for participation made on 2013-02-21.

A list of the individuals and organizations which supported the technical consensus represented by the CEN-CENELEC Workshop Agreement is available to purchasers from the CEN-CENELEC Management Centre. These organizations were drawn from the following economic sectors:

- a car maker,
- a Tier1 automotive supplier,
- an electric vehicle infrastructure and service provider,
- a notified body,
- testing laboratories and
- academic institutes.

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The final review/endorsement round for this CWA was started on 2013-04-25 and was successfully closed on 2013-07-03. The final text of this CWA was submitted to the CEN-CENELEC Management Centre for publication on 2013-08-01.

This CEN-CENELEC workshop agreement (CWA) proposal has been drafted as a collaboration of number of contributing partners under the EASYBAT consortium, which is a European Commission FP7 co-financed project. The members of the FP7 EASYBAT project are a car maker, a Tier1 automotive supplier, an electric vehicle infrastructure and service provider, a notified body, testing laboratories and academic institutes.

Attention is drawn to the possibility that some elements of this document may be subject to patents rights. CEN and/or CENELEC shall not be held responsible for identifying any or all such patent rights.

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Comments or suggestions from the users of the CEN-CENELEC Workshop Agreement are welcome and should be addressed to the CEN-CENELEC Management Centre.

Introduction

Electric vehicles (EV) are considered to be a key element in sustainable transportation models. EV's do not produce any direct emissions as no combustion occurs in the propulsion subsystem of the car. Vehicles equipped with rechargeable energy storage systems (RESS) such as Lithium-ion battery packs are already produced in series by several manufacturers around the world, providing smooth, quiet and affordable means for transportation.

In order to allow mass adoption of EV, car makers need to come up with attractive solutions that meet market needs. One of the most challenging aspects of mass EV adoption is how to extend the driving range of the EV, as existing RESS have a low energy density compared to the energy density of fossil fuels. Not only limited by their energy density, RESS also suffer from relatively long recharging time which can extend to one or several hours, yielding a non-operational vehicle throughout that time.

One of the solutions that are offered by car makers in order to allow fast and simple EV range extension is battery swap. The vehicle enters a roadside facility which replaces the vehicle's depleted (and sometimes hot) battery by a different battery which is at an optimized temperature and adequately charged. The process of battery swap typically lasts a few minutes and allows the EV to drive continuously with only short stops for swapping its battery.

The battery swap system (BSS) is an electro-mechanical installation which contains several subsystems that allows swapping EV batteries, storing the batteries and in most cases charging the batteries. In order to provide the user with an optimized solution which includes reliable EV, battery and battery swap system, there is a need to find engineering solutions which would allow cost effective battery swapping for EV. The engineering solution for swapping batteries of an EV includes the development of several components which serve as interfaces between the car, the battery and the BSS. In order to allow the solution to be adopted by the industry and public, there is a need to standardize those interfaces. The purpose of this document is to propose a standardized concept that meets industry requirements and allows cost effective development of EV, swappable batteries and BSS.

Standardizing interfaces is also a basic tool to improve supply chain management and improve the efficiency of maintenance and manufacturing.

Several car makers and EV service providers have launched commercial products that allow the public to benefit from means of transportation emitting zero emissions, supported by an infrastructure network that provides immediate service around the clock. Some of these stakeholders have teamed up to gather all knowledge and experience under one consortium in an EU FP7 project called EASYBAT. The EASYBAT consortium has been operating since January 2011 in order to define the interfaces between the car, the battery and the BSS and to investigate the benefits and impact of mass EV adoption using battery swap as a means for range extension. The consortium engineers analysed, designed and tested a solution which is described in this document.

The European Committee for Standardization (CEN) and the European Committee for Electrotechnical Standardization (CENELEC) draws attention to the fact that it is claimed that compliance with this document may involve the use of the following patents:

- System of linking a power battery of a motor vehicle – n°FR1151629 (France) and WOFR2012000073 (worldwide)

- System of locking / unlocking of an object under a structure with rapprochement and support hook – n° FR1252323

- System of locking / unlocking of an object on a structure with supporting and tools integrated alignment elements – n°FR1252312

CEN and CENELEC take no position concerning the evidence, validity and scope of this patent right.

The holder of this patent right has assured CEN and CENELEC that he/she is willing to negotiate licences either free of charge or under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the holder of this patent right is registered with CEN and CENELEC. Information may be obtained from:

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CEN (http://www.cen.eu/cen/WorkArea/IPR/Pages/default.aspx) and CENELEC (http://www.cenelec.eu/membersandexperts/toolsandapplications/index.html) maintain on-line lists of patents relevant to their standards. Users are encouraged to consult the lists for the most up to date information concerning patents."

1 Scope

This CEN-CENELEC workshop agreement proposes standards which enable the mass adoption of EV with swappable battery packs by defining simple, robust and reliable interfaces between EV, swappable battery pack and battery swap system (BSS). This agreement will cover the proposed architecture and design for automotive components which connect the battery pack to the vehicle and the BSS. This document deals with passenger vehicles of classes A to D and light commercial vehicles (LCV) of class LCV 1, with a swappable battery pack.

The CWA provides both general guidance, codes of practice and requirements for designing those components. Safety aspects are out of the scope of this document and are dealt with in other standards such as ISO 26262, which covers functional safety of automotive components and subsystems. Battery swapping systems' safety is covered in IEC 62840.

2 Normative references

Not applicable.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply:

3.1
AHV
Automotive High Voltage
in the automotive industry, any voltage above 60 V (AC or DC)

3.2
ALV
Automotive Low Voltage
in the automotive industry, any voltage up to 60 V (AC or DC)

3.3
AIAG
Automotive Industry Action Group
automotive industry organization that maintains FMEA / PPAP Standards and reporting forms

3.4
Swappable Battery
exchangeable RESS (which includes battery cells, battery modules, conduits, battery management system, sensors, contactors and more, all packed inside an enclosure which is mounted to/in an EV. Note: see also the definition of eRESS as proposed in IEC 62840

3.5
BIW
Body In White
structural assembly of the vehicle

3.6
BMS
Battery Management System
digital controller which monitors and controls battery operation and communicates with the vehicle management system (VMS) and the BSS