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Communication protocols for swapping battery pack of electric vehicle

电动汽车快换电池箱通信协议

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Foreword

This document was drafted in accordance with the provisions of GB/T 1.1-2020 "Directives for standardization - Part 1: Rules for the structure and drafting of standardizing documents".

This document replaces GB/T 32895-2016 "Communication protocols for swapping battery pack of electric vehicle". Compared with GB/T 32895-2016, in addition to editorial changes, the main technical changes are as follows.

a) CHANGE the CAN bus description (see 4.1; 4.1 of the 2016 edition);

b) ADD the requirements for the battery pack and the battery swap station to use charging CAN and monitoring CAN (see 4.2 and 4.3);

c) ADD the CAN FD communication rate requirements and communication architecture

requirements (see Chapter 5);

d) ADD and CHANGE the overall communication process requirements (see Chapter 8; Chapter 8 of the 2016 edition);

e) ADD the charging CAN message, which replaces the original message classification and message format and content requirements; ADD the battery swap station query of battery pack information, charge and discharge state, battery pack code, BMS software version, BMS hardware version, battery pack communication protocol version; ADD the message format of battery pack mileage information, battery pack control action response, charging termination information, battery swap station charging data, battery pack liquid cooling system information, charge and discharge state (see Appendix A; Chapter 9 and Chapter 10 of the 2016 edition);

f) ADD the battery pack information query at battery swap station (see Appendix A.2.1);

g) ADD the basic information message classification requirements, including battery pack code, BMS software version, BMS hardware version, battery pack communication protocol version, battery pack mileage information (see

Appendix A 2.2.1; 9.1 of the 2016 edition);

h) ADD the classification requirements of operation data messages, including battery pack control action response, charging termination information, battery swap station charging data, liquid cooling system information (see Appendix A.2.2.2; 9.2 of the 2016 edition);

i) DELETE the maintenance message (see 9.3 of the 2016 edition);

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1 Scope

This document specifies the communication physical layer, data link layer, application layer, overall communication process, CAN message, interchangeability requirements of the swapping battery pack of electric vehicle (hereinafter referred to as "battery pack"), based on the controller area network (CAN2.0/CAN FD).

This document applies to the communication between the battery pack and the charging system of the battery swap station (hereinafter referred to as "battery swap station").

2 Normative references

GB/T 19596

GB/T 27930

GB/T 29317

ISO 11898

ISO 11898

ISO 11898

4.1 The battery pack communication interface adopts CAN bus (including. CAN2.0 and

CAN FD), which is compatible with the communication network of the road vehicle control system, including.

a) The CAN communication interface between the charging device and the BMS (hereinafter referred to as "charging CAN"), whose communication network is based on CAN2.0B and uses extended frame requirements;

b) The CAN communication interface between the vehicle management system and the BMS (hereinafter referred to as "monitoring CAN"), whose communication network is based on CAN bus (including. CAN2.0 and CAN FD), using standard frames or extended frames.

4.2 When the charging CAN is used for communication interaction between the battery

pack and the battery swap station, the message meets the requirements of 9.1; when the monitoring CAN is used for communication interaction between the battery pack and the battery swap station, the message meets the requirements of 9.2.

4.3 The message format and content of charging CAN and monitoring CAN shall meet the relevant provisions of Appendix A and Appendix B.

4.4 After the battery pack is physically connected in the battery swap station and the BMS auxiliary power is powered on and awakened, it shall include two states. static monitoring state and charging and discharging state. The state transition of the battery pack in the battery swap station is shown in Figure 1.

4.5 Data transmission adopts the format of sending the low bit first. The positive current value represents discharge, whilst the negative current value represents charging.

4.6 The communication model between the battery pack and the battery swap station is divided into the physical layer, the data link layer, the application layer.

4.7 The battery pack can be used in combination of one box or multiple boxes. The network topology diagram is shown in Appendix C.

5.1 General requirements

The physical layer shall comply with the provisions on the physical layer in ISO 11898- 1, ISO 11898-2, ISO 11898-5, SAE J1939-11.The communication rate of CAN2.0 shall be no

less than 250 kbit/s; the control segment of CAN FD shall be no less than 250 kbit/s; the data segment shall be no less than 1 Mbit/s.

5.2.1 The battery pack has two independent communication CANs. one charging CAN

and one monitoring CAN. This method is defined as communication architecture I.

After the battery pack BMS wakes up, the battery pack and the battery swap station in the communication architecture I enter the static monitoring state and send static state message information through the monitoring CAN. In the charging and discharging state, the charging and discharging state message information is sent through the charging CAN; because the two CAN channels are independent, the monitoring CAN can continue to send messages in the charging and discharging state. The schematic diagram of communication architecture I is shown in Figure 2.

5.2.2 The battery pack has charging CAN and monitoring CAN functions through an

independent communication CAN. This method is defined as communication architecture II. The battery pack and battery swap station under communication architecture II enter the static monitoring state, after the battery pack BMS wakes up;

sends the static state message information through the CAN channel. If it enters the charging and discharging state, the charging and discharging state message information is sent through the CAN channel. The schematic diagram of communication architecture II is shown in Figure 3.

6.6 Message type

Supports 5 types of messages, namely command, request, broadcast/response, confirmation, group function. The specific definition complies with the provisions of message types in GB/T 27930.

7 Application layer

7.1 The application layer adopts the form of parameter and parameter group definition.

7.2 PGN is used to number the parameter group; each node identifies the content of the data packet according to PGN.

7.3 Use "Request PGN" to actively obtain the parameter group of other nodes.

7.4 Use periodic transmission and event-driven methods to send data.

7.5 If multiple PGN data need to be sent to implement a function, multiple PGN messages