

UNDERWRITERS LABORATORIES INC. CERTIFICATION REQUIREMENT DECISION

This Certification Requirement Decision is prepared by UL LLC. It is normative for the applicable UL Product Certification Program(s); however, it is currently not part of the UL Standard(s) referenced below.

Product Category (CCN): FFTG

Standard Number: UL 2202

Standard Title: Standard for Electric Vehicle (EV) Charging System Equipment

Edition Date: October 2, 2009

Edition Number: 2

Section / Paragraph Reference: Supplement SB (New)

Subject: Liquid cooled high power charging system equipment

DECISION:

(NEW)

SUPPLEMENT SB

LIQUID COOLED CHARGER SYSTEMS

INTRODUCTION

1 Scope

1.1 This supplement covers charging equipment systems that utilize liquid cooling to cool the output cable to the electric vehicle and the vehicle connector in order to deliver higher power to an electric vehicle. The liquid cooling system encompasses the entire charging system from charger to vehicle connector in one continuous closed loop. The charging equipment is intended to comply with the requirements in this Supplement.

1.2 The requirements in this supplement do not cover gaseous cooling systems or simple de-rating of current to control temperature.

2 Glossary

2.1 INTERMEDIATE CURRENT LEVELS – Output current levels that the system may choose to utilize as allowable output currents based on input from various systems monitoring and sensing devices. These current level values are numerically between the Normal Rated Current and the Maximum Rated Current.

2.2 NORMAL RATED CURRENT - Current rating for which the output cable to the electric vehicle is sized to handle without any cooling means.

2.2 MAXIMUM RATED CURRENT – Current rating for which the charging system equipment is designed to provide to the EV when liquid cooling is provided and in use.

CONSTRUCTION

3 General

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Documents

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3.1 The requirements in this supplement are intended to add to the requirements in UL 2202. As such, the two documents are intended to be used in conjunction when evaluating the charging system equipment with liquid cooling.

3.2 The liquid cooling system is intended to cool the output cable to the electric vehicle and the contacts within the vehicle connector when the maximum rated current is being conducted. At any time during normal operation, the temperature of the contacts in the vehicle connector shall not exceed 90 °C. As a minimum during operation, the contact temperatures are to be monitored.

3.3 With reference to 3.2, all liquid cooled charging systems shall be rated with a maximum rated current that indicates the current rating when liquid cooling is used.

3.4 The charging system may operate in one of three distinct operational modes. All operational modes involve monitoring the temperature of the contacts as indicated in 3.2 and when the temperature monitoring indicates the temperatures are approaching 90 °C, the system is to perform a specific function as indicated below.

- a) For operational mode 1, the unit shall shut down and all output is reduced to zero.
- b) For operational mode 2, the output shall be reduced to the normal rated current level without shut down in order to reduce the temperature at the contacts. Temperature monitoring is to continue. No intermediate levels are allowed. If temperatures continue to approach 90 °C after the initial current reduction, the unit shall shut down and all output is reduced to zero.
- c) For operational mode 3, the charging system shall reduce current to either the normal rated current level or, as an option, to an intermediate current level. Monitoring is to continue in either case. If temperatures or other monitored parameters indicate a further reduction in current is necessary, then the system can reduce current to the normal rated current level or lower intermediate limit can be chosen. Once the unit reduces to the normal rated current, regardless of how many intermediate levels are used, any temperature indication approaching 90 °C requires the unit to shut down and all output is reduced to zero.

3.5 With reference to 3.4, charging systems that use operational mode 2 shall have a normal rated current for the non-liquid cooled operating condition. Systems for operational mode 3 shall have a normal rated current level and all intermediate current levels indicated. Testing of the unit will incorporate and verify all of these current level limits.

3.6 The charging equipment system may be contained within one enclosure or may be in multiple enclosures that are interconnected by cable or conduit. In the case where the multiple enclosures are interconnected, the wiring or cabling used to interconnect the systems shall be evaluated in the same manner as the output cable to the electric vehicle. See 4.2.1 and Section 7. The interconnecting cabling shall be included in the risk assessment in Section 5.

3.7 The charging system may monitor many different parameters associated with the liquid cooling. The manufacturer can choose which parameters are to be included in the design based on risk mitigation needs. See Risk Assessment, Section 5.

3.8 With reference to 3.7, the contact temperatures in the vehicle connector shall always be one of the parameters monitored. The contact temperature monitoring shall require one monitoring device or sensor on each of the DC contacts in the vehicle connector. During operation of the charging system at maximum rated current, the monitoring devices or sensors on the DC contacts shall continuously send a signal to the charging system equipment control system. If at any time during operation, one or both of the monitoring devices or sensors fails to send a signal to the charging system equipment, the output current