**Electric Vehicle Battery Packs (FFRW)–Continued**

**UL MARK**

The Certification Mark of UL on the product is the only method provided by UL to identify products manufactured under its Certification and Follow-Up Service. The Certification Mark for these products includes the UL symbol, the word “CERTIFIED” and “SAFETY,” the geographic identifier(s), and a file number.

**Additional Certification Markings**

Products covered under this category are additionally marked with the following information:

- FOR CHARGING INDOORS WITHOUT MECHANICAL BUILDING VENTILATION IN [COMPANY NAME] ELECTRIC VEHICLE [MODEL, NAME]
- Alternate UL Mark

The Certification Mark of UL on the product is the only method provided by UL to identify products manufactured under its Certification and Follow-Up Service. The Certification Mark for these products includes the UL symbol, the word “CERTIFIED” above the UL symbol (as illustrated in the Introduction of this Directory), and the following additional information:

**ELECTRIC VEHICLE BATTERY PACK**

FOR CHARGING INDOORS WITHOUT MECHANICAL BUILDING VENTILATION IN [COMPANY NAME] ELECTRIC VEHICLE [MODEL, NAME]

Control No.

For rebuilt products the word “Rebuilt,” “Remanufactured” or “Reconditioned” precede the product name.

UL, in performing its functions in accordance with its objectives, does not assume or undertake to discharge any responsibility of the manufacturer or any other party. UL shall not incur any obligation or liability for any loss, expense or damages, including incidental or consequential damages, arising out of or in connection with the use, interpretation of, or reliance upon this Guide Information.

**Traction Motors (FFWT)–Continued**

**Alternate UL Mark**

The Certification Mark of UL on the product is the only method provided by UL to identify products manufactured under its Certification and Follow-Up Service. The Certification Mark for these products includes the UL symbol, the word “REFERENCES” above the UL symbol (as illustrated in the Introduction of this Directory), and the following additional information:

**TRACTION MOTOR AS TO CONSTRUCTION AND OPERATION AT RATED OUTPUT**

Control No.

UL, in performing its functions in accordance with its objectives, does not assume or undertake to discharge any responsibility of the manufacturer or any other party. UL shall not incur any obligation or liability for any loss, expense or damages, including incidental or consequential damages, arising out of or in connection with the use, interpretation of, or reliance upon this Guide Information.

**Power Converters/Inverters for Use in Electric Land Vehicles (FFZS)**

**USE AND INSTALLATION**

This category covers power converters and power inverters intended for use in electric vehicles.

An electric vehicle is defined as an automotive-type vehicle for over-the-road use, such as passenger automobiles, buses, trucks, vans, neighborhood electric vehicles, and the like, primarily powered by a combustion engine, an electric motor, or both, and draws current from a rechargeable storage battery, fuel cell, photovoltaic array, or other source of electric current.

This category covers fixed and stationary power converters having a nominal rating of 1000 V or less, direct or alternating current. This category also covers fixed, stationary and portable power inverters having a dc input and a 120 or 240 V ac output. These converters/inverters are intended for use within electric land vehicles where not directly exposed to outdoor conditions.

This category also covers converters/inverters that are additionally intended to charge batteries.

**PRODUCT IDENTITY**

One of the following product identities appears on the product:

- Electric Vehicle Power Converter
- Electric Vehicle Power Inverter
- EV Power Converter
- EV Power Inverter

**RELATED PRODUCTS**

See Electric Vehicle Battery Packs (FFRW) and Traction Motors (FFWT).

**ADDITIONAL INFORMATION**

For additional information, see Electrical Equipment for Use in Ordinary Locations (AALZ).

**Requirements**

The basic requirements used to investigate products in this category are contained in UL Subject 458A, “Outline of Investigation for Power Converters/Inverters for Electric Land Vehicles.”

**UL MARK**

The Certification Mark of UL on the product is the only method provided by UL to identify products manufactured under its Certification and Follow-Up Service. The Certification Mark for these products includes the UL symbol, the words “CERTIFIED” and “SAFETY,” the geographic identifier(s), and a file number.

**Alternate UL Mark**

UL, in performing its functions in accordance with its objectives, does not assume or undertake to discharge any responsibility of the manufacturer or any other party. UL shall not incur any obligation or liability for any loss, expense or damages, including incidental or consequential damages, arising out of or in connection with the use, interpretation of, or reliance upon this Guide Information.

**Electrical Circuit Integrity Systems (FHIT)**

**General**

**Look for the UL Mark on Product**

**ON-BOARD ELECTRIC VEHICLE EQUIPMENT (FFZA)**

**ON-BOARD ELECTRIC VEHICLE EQUIPMENT (FFZA)**

**181**

**ON-BOARD ELECTRIC VEHICLE EQUIPMENT (FFZA)**

**181**
This category covers electrical circuit integrity systems consisting of components and materials intended for installation as protection for specific electrical wiring systems, with respect to the disruption of electrical circuit integrity upon exterior fire exposure.

Ratings apply only to the entire system assembly, constructed using the combination of components and materials specified in the individual system. Components and materials are designated for use in a specific individual assembly for which corresponding ratings have been developed, and are not intended to be interchanged between systems. Ratings are not assigned to individual system components or materials.

Electrical circuit integrity systems are intended to be fastened to a concrete or masonry wall or a concrete floor-ceiling assembly. The fire rating of the wall or floor-ceiling assembly is intended to be equal to or greater than the rating of the electrical circuit integrity system. This is to ensure that the complete electrical circuit integrity system will survive during fire and hose stream exposure.

**SYSTEMS INCORPORATING CABLE PROTECTED WITH ELECTRICAL CIRCUIT PROTECTIVE MATERIALS**

These electrical circuit integrity systems are investigated with respect to fire exposure and water hose stream performance. Performance criteria are based on temperatures within the enclosure and visual examination after the water hose stream.

These systems are intended to be installed in interior environments with representative heating and air conditioning, unless stated otherwise in the individual system.

Where indicated in the system, the ampacity reduction due to the electrical circuit protection system has been determined for normal temperature operating conditions in accordance with IEEE 848 (1996), "IEEE Standard Procedure for the Determination of the Ampacity Derating of Fire-Protected Cables." If not specified in the system, the effect of the electrical circuit protection system on the ampacity of the electrical conductors has not been investigated. The specifications for the system and its assembly are important details in the development of the ratings. Information concerning these details is described in each system.

The products used in these systems are intended to be installed in accordance with all the provisions of ANSI/NFPA 70, "National Electrical Code" (NEC), and as amended by the details of each individual system (such as type of supports) and the accompanying instructions.

Authorities Having Jurisdiction should be consulted as to the specific requirements covering the installation and use of these systems.

**SYSTEMS CONSTRUCTED WITH FIRE-RESISTIVE CABLE**

These electrical circuit integrity systems are investigated with respect to fire exposure and water hose stream performance. Performance criteria are based on functionality of the cable during the fire and after the water hose stream.

These systems are intended to be installed in accordance with all provisions of the NEC and as amended by the details of each individual system (such as type of supports) and the accompanying instructions.

Authorities Having Jurisdiction should be consulted as to the specific requirements covering the installation and use of these systems.

**RELATED PRODUCTS**

See Electrical Circuit Protective Materials (FHIY).

See Fire-resistant Cable (FHIJR).

**ADDITIONAL INFORMATION**

For additional information, see Fire-resistance Ratings (BXRH).

**REQUIREMENTS**

The basic requirements used to investigate systems incorporating cable protected with electrical circuit protective materials in this category have been determined in UL Subject 1724, "Outline of Investigation for Fire Tests for Electrical Circuit Protective Systems."

The basic standard used to investigate systems constructed with fire-resistant cable in this category is ANSI/UL 2196, "Tests for Fire Resistant Cables."

**UL MARK**

System components identified by an (*) in the description text are classified under the Classification and Follow-Up Service of UL. Such components and names of manufacturers who are authorized to apply the Classification Mark are identified under the specific product category.

UL, in performing its functions in accordance with its objectives, does not assume or undertake to discharge any responsibility of the manufacturer or any other party. UL shall not incur any obligation or liability for any loss, expense or damage, including incidental or consequential damages, arising out of or in connection with the use, interpretation of, or reliance upon this Guide Information.

**ELECTRICAL CIRCUIT PROTECTIVE MATERIALS (FHIY)**

This category covers electrical circuit protective materials of proprietary composition, intended for installation in accordance with the application instructions provided with the product and as specified on the design card for an individual electrical circuit protective system. Properties of these materials, other than the degree of fire resistance provided to specific electrical wiring systems, have not been investigated. Authorities Having Jurisdiction should be consulted before installation.

**PRODUCT IDENTIFY**

The following product identity appears on the product:

**ELECTRICAL CIRCUIT PROTECTIVE MATERIALS (FHIY)—Continued**

**ELECTRICAL CIRCUIT INTEGRITY SYSTEMS (FHIIT)**

Electrical Circuit Protective Materials (FHIY)—Continued

For additional information, see Electrical Circuit Integrity Systems (FHIIT) and Fire-resistance Ratings (BXRH).

**ADDITIONAL INFORMATION**

For additional information, see Fire Resistance Ratings (BXRH).

**REQUIREMENTS**

The basic requirements used to investigate products in this category are contained in UL Subject 1724, "Outline of Investigation for Fire Tests for Electrical Circuit Protective Systems."

**UL MARK**

The Certification Mark of UL on the product or on the smallest unit container in which the product is packaged is the only method provided by UL to identify products manufactured under its Certification and Follow-Up Service. The Certification Mark for these products includes the UL symbol, the words "CERTIFIED" and "SAFETY," the geographic identifier(s), and a file number.

**ADDITIONAL CERTIFICATION MARKINGS**

Products covered under this category are additionally marked with the following information:

**FOR USE IN ELECTRICAL CIRCUIT PROTECTIVE SYSTEMS**

**SYSTEM NO. __**

**SEE UL ONLINE CERTIFICATIONS DIRECTORY**

Alternate UL Mark

The Classification Mark of UL on the product or on the smallest unit container in which the product is packaged is the only method provided by UL to identify products manufactured under its Certification and Follow-Up Service. The Classification Mark for these products includes the UL symbol, the word "CLASSIFIED" above the UL symbol (as illustrated in the introduction of this Directory), and the following additional information:

**ELECTRICAL CIRCUIT PROTECTIVE MATERIALS FOR USE IN ELECTRICAL CIRCUIT PROTECTIVE SYSTEMS**

**SYSTEM NO. __**

**SEE UL BUILDING MATERIALS DIRECTORY**

Control No.

UL, in performing its functions in accordance with its objectives, does not assume or undertake to discharge any responsibility of the manufacturer or any other party. UL shall not incur any obligation or liability for any loss, expense or damage, including incidental or consequential damages, arising out of or in connection with the use, interpretation of, or reliance upon this Guide Information.

**FIRE-RESISTIVE CABLE (FHIJR)**

**USE AND INSTALLATION**

This category covers fire-resistive cable, which is insulated electrical cable intended for installation as protective covering for individual electrical circuit integrity systems. This cable has been investigated for its ability to remain electrically functional during a fire exposure and after the impact, erosion and cooling effect of a water hose stream test.

There are two fire exposure conditions: normal temperature rise (same as ANSI/UL 2196, "Tests for Fire Resistant Cables") and rapid temperature rise (to ANSI/UL 1709, "Rapid Rise Fire Tests of Protection Materials for Structural Steel"). If not stated otherwise in the individual certifications, the normal temperature rise exposure was used.

This cable is required to comply with national requirements for electrical safety in addition to requirements related to its continued operation under fire exposure.

The cable as used in the specified systems has been investigated and found to comply with applicable electrical requirements.

The cable is intended to be installed in accordance with the provisions of ANSI/NFPA 70, "National Electrical Code," where indicated in the system, and the manufacturer's installation instructions.

Authorities Having Jurisdiction should be consulted before installation.

**PRODUCT IDENTIFY**

The following product identity appears on the product:

**FIRE-RESISTIVE CABLE**

**ADDITIONAL INFORMATION**

For additional information, see Electrical Circuit Integrity Systems (FHIIT) and Fire-resistance Ratings (BXRH).

**REQUIREMENTS**

The basic standard used to investigate products in this category is ANSI/UL 2196, "Tests for Fire Resistant Cables," or ANSI/UL 1709, "Rapid Rise Fire Tests of Protection Materials for Structural Steel."

Data concerning the insulation resistance and leakage-current performance of the electrical cable during tests conducted in accordance with ANSI/UL 2196 are contained in the test report. Test reports are available from the certified company.

**UL MARK**

LOOK FOR THE UL MARK ON PRODUCT