UL 2267

STANDARD FOR SAFETY

Fuel Cell Power Systems for Installation in Industrial Electric Trucks

UL Standard for Safety for Fuel Cell Power Systems for Installation in Industrial Electric Trucks, UL 2267

Third Edition, Dated March 26, 2020

Summary of Topics

This is the Third Edition of UL 2267 dated March 26, 2020 which includes several substantive changes to update the requirements to address current technology and safety issues.

The new requirements are substantially in accordance with Proposal(s) on this subject dated July 12, 2019 and November 29, 2019.

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Fuel Cell Power Systems for Installation in Industrial Electric Trucks

First Edition – April, 2006
Second Edition – March, 2013

Third Edition

March 26, 2020

This ANSI/UL Standard for Safety consists of the Third Edition.

The most recent designation of UL 2267 as an American National Standard (ANSI) occurred on February 25, 2020. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, and Title Page.

Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at https://csds.ul.com.

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INTRODUCTION

1 Scope

1.1 These requirements cover fuel cell power systems intended to be installed in Type E, Type CGH, Type CGH-EE, Type CHG-ES, or Type CGH-EX industrial trucks used in locations as defined in the Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Conversions, Maintenance, and Operations, NFPA 505, the National Electrical Code, NFPA 70, and the Standard for Electric-Battery-Powered Industrial Trucks, UL 583.

1.2 The fuel cell power systems covered by this Standard are anticipated for use as described in the following standards as applicable to the intended truck:

a) Safety Standard for Low Lift and High Lift Trucks, ITSDF B56.1;

b) Safety Standard for Guided Industrial Vehicles and Automated Functions of Manned Industrial Vehicles, ITSDF B56.5;

c) Safety Standard for Rough Terrain Forklift Trucks, ITSDF B56.6;

d) Safety Standard for Industrial Crane Trucks, ITSDF B56.7;

e) Safety Standard for Personnel and Burden Carriers, ITSDF B56.8;

f) Safety Standard for Operator Controlled Industrial Tow Tractors, ITSDF B56.9; and the

g) Safety Standard for Manually Propelled High Lift Industrial Trucks, ITSDF B56.10.

1.3 These requirements cover fuel cell power systems that incorporate a permanently mounted pressure vessel containing compressed hydrogen gas.

1.4 These requirements cover the use of designs that are fueled by hydrogen gas without the pressure vessel being removed from the industrial truck (onboard fueling).

1.5 These requirements cover only the fuel cell and fuel cell balance of plant components including the power and/or power conditioning electronics, regardless of packaging, as defined in 5.11 and Figure 5.1, as well as any components in classified zones.

2 Components

2.1 A component of a product covered by this Standard shall:

a) Comply with the requirements for that component;

b) Be used in accordance with its rating established for the intended conditions of use;

c) Be used within its established use limitations or conditions of acceptability; and

d) Comply with the applicable requirements of this end product Standard.

2.2 A component of a product covered by this Standard is not required to comply with a specific component requirement that:

a) Involves a feature or characteristic not required in the application of the component in the product;

b) Is superseded by a requirement in this Standard; or

c) Is separately investigated when forming part of another component, provided the component is used within its established ratings and limitations.

2.3 Specific components are incomplete in construction features or restricted in performance capabilities. Such components are intended for use only under limited conditions, such as certain temperatures not exceeding specified limits, and shall be used only under those specific conditions.

2.4 A component that is also intended to perform other functions such as overcurrent protection, ground-fault circuit-interruption, surge suppression, any other similar functions, or any combination thereof, shall additionally comply with the requirements of the applicable UL Standard that covers devices that provide those functions.

3 Units of Measurement

3.1 Values stated without parentheses are the requirement. Values in parentheses are explanatory or approximate information.

4 Referenced Publications

4.1 Any undated reference to a code or standard appearing in the requirements of this standard shall be interpreted as referring to the latest edition of that code or standard.

4.2 The following publications are referenced in this Standard:

ANSI:

ANSI HGV 2, *Compressed Hydrogen Gas Powered Vehicle Fuel Containers*

ANSI/IAS NGV 4.2, *Hoses for Natural Gas Vehicles and Dispensing Systems*

ANSI Z21.24/CSA/CGA 6.10, *Connectors for Gas Appliances*

ANSI Z535.1, *American National Standard for Safety Colors*

ANSI Z535.3, *American National Standard for Criteria for Safety Symbols*

ANSI Z535.4, *American National Standard for Product Safety Signs and Labels*

ASME:

ASME B31, *Code for Pressure Piping*

ASME B31.3, *Process Piping*

ASTM:

ASTM D3580, *Standard Test Methods for Vibration (Vertical Linear Motion) Test of Products*

ASTM D5112, *Standard Test Method for Vibration (Horizontal Linear Motion) Test of Products*

ASTM E230/E230M, *Standard Specification and Temperature-Electromotive Force (emf) Tables for Standardized Thermocouples*

ASTM F1459, *Standard Test Method for Determination of the Susceptibility of Metallic Materials to Hydrogen Gas Embrittlement (HGE)*

ASTM G142, *Standard Test Method for Determination of Susceptibility of Metals to Embrittlement in Hydrogen Containing Environments at High Pressure, High Temperature, or Both*

CFR:

CFR 1910.145, (OSHA) Specifications for Accident Prevention Signs and Tags

CGA:

CGA G-5.5, *Hydrogen Vent Systems*

CSA:

CSA HGV 3.1, *Fuel System Components for Compressed Hydrogen Gas Powered Vehicles*

CSA HPIT 1, *Compressed Hydrogen Powered Industrial Truck On-Board Fuel Storage and Handling Components*

CSA HPIT 2, *Dispensing Systems and Components for Fueling Hydrogen Powered Industrial Trucks*

CSA HPRD1, *Thermally Activated Pressure Relief Devices for Compressed Hydrogen Vehicle Fuel Containers*

IEC:

IEC 60079-10-1, *Explosive Atmospheres – Part 10-1: Classification of Areas – Explosive Gas Atmospheres*

IEC 60529, *Degrees of Protection Provided by Enclosures (IP Code)*

IEC 60812, *Analysis Techniques for System Reliability – Procedure for Failure Mode and Effects Analysis (FMEA)*

IEC 61025, *Fault Tree Analysis (FTA)*

IEC 61508 (all parts), *Functional Safety of Electrical/Electronic/Programmable Electronic Safety-Related Systems*

IEC/ISO:

IEC/ISO 31010, Risk Management - Risk Assessment Techniques

ISO:

ISO 4080, *Rubber and Plastics Hoses and Hose Assemblies – Determination of Permeability to Gas*