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# PUBLICLY AVAILABLE SPECIFICATION

## PRE-STANDARD



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**Fuel cell technologies –  
Part 6-150: Micro fuel cell power systems – Safety – Water reactive (UN Division  
4.3) compounds in indirect PEM fuel cells**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

PRICE CODE **XC**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**FUEL CELL TECHNOLOGIES –**

**Part 6-150: Micro fuel cell power systems – Safety –  
Water reactive (UN Division 4.3) compounds in indirect PEM fuel cells**

FOREWORD

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A PAS is a technical specification not fulfilling the requirements for a standard, but made available to the public.

IEC-PAS 62282-6-150 has been processed by IEC technical committee 105: Fuel cell technologies.

The text of this PAS is based on the following document:

This PAS was approved for publication by the P-members of the committee concerned as indicated in the following document

Draft PAS	Report on voting
105/309/PAS	105/321/RVD

Following publication of this PAS, which is a pre-standard publication, the technical committee or subcommittee concerned may transform it into an International Standard.

This PAS shall remain valid for an initial maximum period of 3 years starting from the publication date. The validity may be extended for a single period up to a maximum of 3 years, at the end of which it shall be published as another type of normative document, or shall be withdrawn.

A bilingual version of this publication may be issued at a later date.

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## FUEL CELL TECHNOLOGIES –

### Part 6-150: Micro fuel cell power systems – Safety – Water reactive (UN Division 4.3) compounds in indirect PEM fuel cells

#### 1 Scope

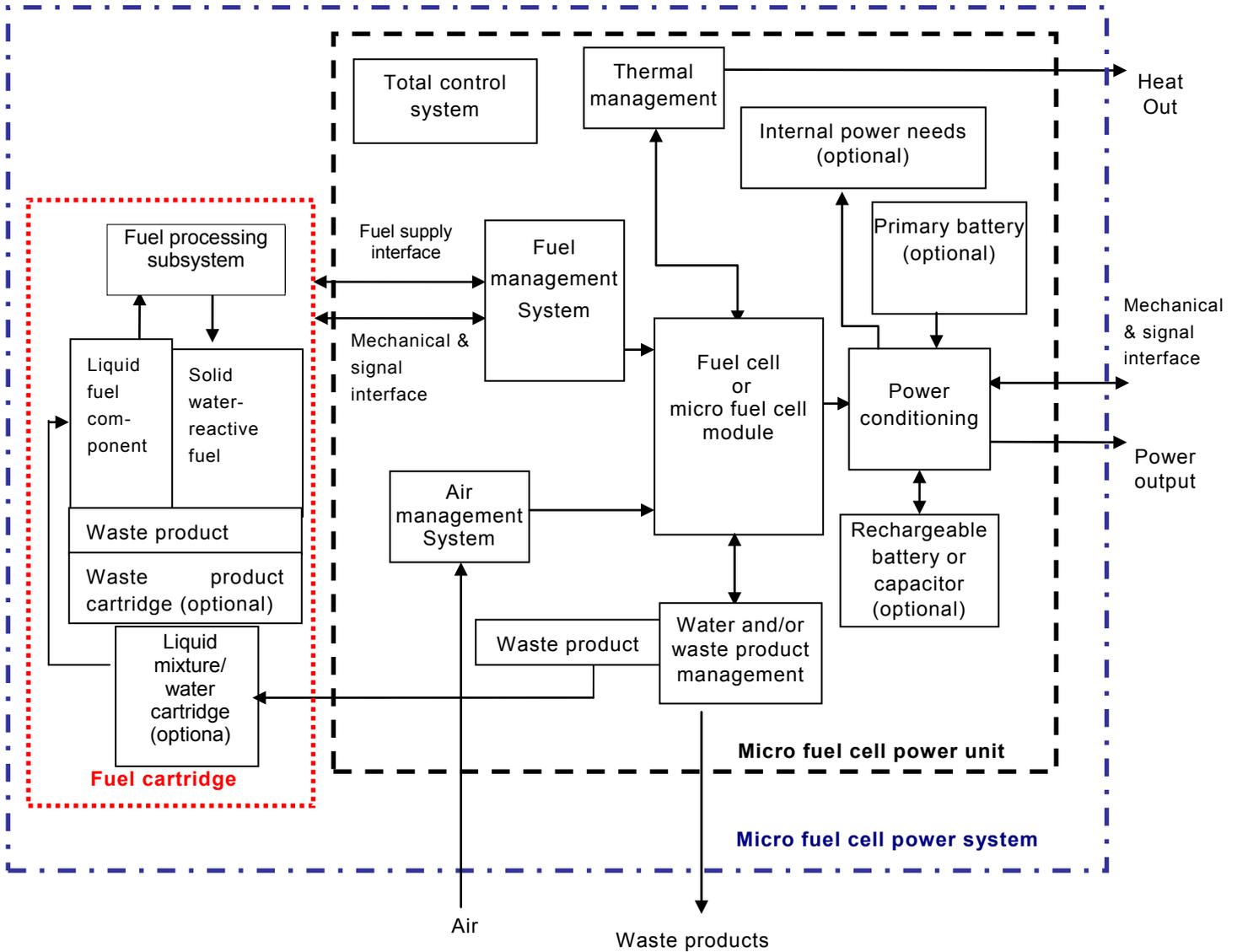
##### 1.1 General

- a) This consumer safety PAS covers micro fuel cell power systems using hydrogen produced from the reaction of an aqueous solution with solid UN Division 4.3 (water-reactive) compounds in indirect PEM fuel cell systems that are wearable or easily carried by hand, providing d.c. outputs that do not exceed 60 V d.c. and power outputs that do not exceed 240 VA. Portable fuel cell power systems that provide output levels that exceed these electrical limits are covered by IEC 62282-5-1.
- b) Externally accessible circuitry is therefore considered to be safety extra low voltage (SELV) circuitry as defined in IEC 60950-1:2005, and as limited power circuits if further compliance with 2.5 of IEC 60950-1:2005 is demonstrated. Micro fuel cell power systems or units that have internal circuitry exceeding 60 V d.c. or 240 VA should be appropriately evaluated in accordance with the separate criteria of IEC 60950-1:2005.
- c) This consumer safety PAS establishes requirements for micro fuel cell power systems, micro fuel cell power units and fuel cartridges using hydrogen produced from the reaction of an aqueous solution with solid UN Division 4.3 (water-reactive) compounds for use in indirect PEM fuel cell systems to ensure a reasonable degree of safety for normal use, reasonably foreseeable misuse, and consumer transportation of such items. The fuel cartridges covered by this PAS are not intended to be refilled by the consumer. Fuel cartridges refilled by the manufacturer or by trained technicians shall meet all requirements of this PAS.
- d) These products are not intended for use in hazardous areas as defined by IEC 60079-10-1.

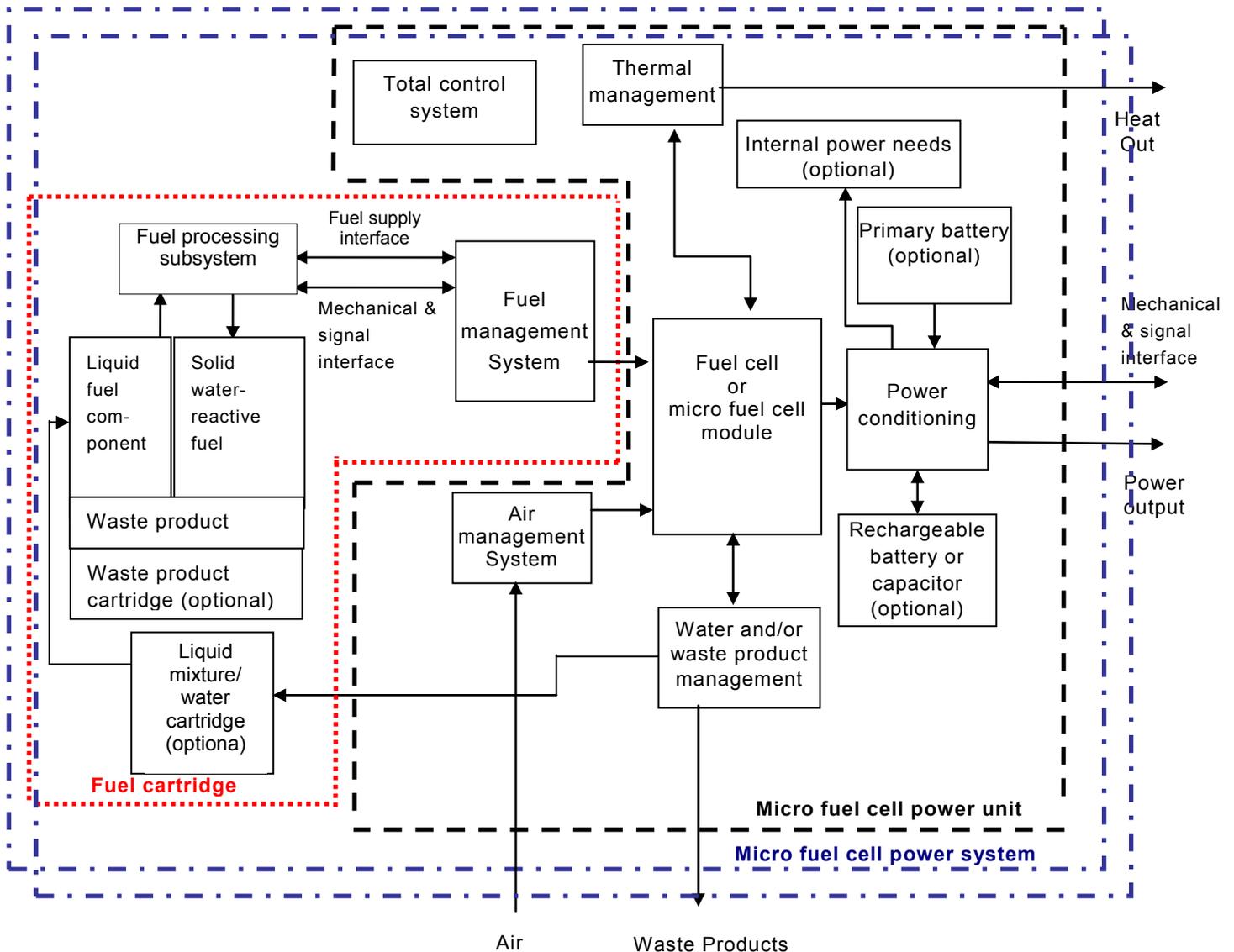
##### 1.2 Fuels and technologies covered

- a) This PAS covers micro fuel cell power systems, micro fuel cell power units and fuel cartridges using hydrogen produced from the reaction of an aqueous solution with solid UN Division 4.3 (water reactive) solid compounds as fuel. These systems and units use polymer electrolyte membrane fuel cell technologies. The designs may include fuel processing subsystems to derive hydrogen gas from the water-reactive solid fuel.
- b) Micro fuel cell power system block diagrams for covered systems are shown in Figures 1.1 and 1.2.
- c) All portions of this PAS apply to micro fuel cell power systems, micro fuel cell power units and fuel cartridges as defined in 1.1 above.

Clauses 1 through 7 of this PAS parallel the general safety requirements given in IEC 62282-6-100, considered relevant to micro fuel cell systems of all types and further includes requirements specific to water reactive solid fuels as included in Annex F of IEC 62282-6-100:2010.



**Figure 1.1 – Micro fuel cell power system block diagram for UN Division 4.3 (water reactive) compound fuel in indirect PEM fuel cell system – Fuel management system in micro fuel cell power unit**



**Figure 1.2 – Micro fuel cell power system block diagram for UN Division 4.3 (water reactive) compound fuel in indirect PEM fuel cell system – Fuel management system in fuel cartridge**

### 1.3 Equivalent level of safety

- The requirements of this PAS are not intended to constrain innovation. The manufacturer may consider fuels, materials, designs or constructions not specifically dealt with in this PAS. These alternatives should be evaluated as to their ability to yield levels of safety equivalent to those prescribed by this PAS.
- It is understood that all micro fuel cell power systems, micro fuel cell power units and fuel cartridges shall comply with applicable country and local requirements including, but not limited to, those concerning transportation, child-resistance and storage, where required.

## 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60050-426:2008, *International Electrotechnical Vocabulary – Part 426: Equipment for explosive atmospheres*

IEC 60079-15, *Explosive atmospheres – Part 15: Equipment protection by type of protection "n"*

IEC 60086-4, *Primary batteries – Part 4: Safety of lithium batteries* IEC 60086-5, *Primary batteries – Part 5: Safety of batteries with aqueous electrolyte*

IEC 60695-1-10: *Fire hazard testing – Part 1-10: Guidance for assessing the fire hazard of electrotechnical products – General guidelines*

IEC 60695-1-11: *Fire hazard testing – Part 1-11: Guidance for assessing the fire hazard of electrotechnical products – Fire hazard assessment*

IEC 60695-2-11, *Fire hazard testing – Part 2-11: Glowing/hot-wire based test methods – Glow-wire flammability test method for end-products*

IEC 60695-11-10, *Fire hazard testing – Part 11-10: Test flames – 50 W horizontal and vertical flame test methods*

IEC 60730-1:2010, *Automatic electrical controls for household and similar use – Part 1: General requirements*

IEC 60950-1:2005, *Information technology equipment – Safety – Part 1: General requirements*

IEC 61032, *Protection of persons and equipment by enclosures – Probes for verification*

IEC 62133, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications*

IEC 62281, *Safety of primary and secondary lithium cells and batteries during transport*

ISO 175, *Plastics – Methods of test for the determination of the effects of immersion in liquid chemicals*

ISO 188, *Rubber, vulcanized or thermoplastic – Accelerated ageing and heat resistance tests*

ISO 1817, *Rubber, vulcanized – Determination of the effect of liquids*

ISO 9772, *Cellular plastics – Determination of horizontal burning characteristics of small specimens subjected to a small flame*

ISO 15649, *Petroleum and natural gas industries – Piping*

ISO 16000-3, *Indoor air – Part 3: Determination of formaldehyde and other carbonyl compounds – Active sampling method*

ISO 16000-6, *Indoor air – Part 6: Determination of volatile organic compounds in indoor and test chamber air by active sampling on Tenax TA sorbent, thermal desorption and gas chromatography using MS/FID*

ISO 16017-1, *Indoor, ambient and workplace air – Sampling and analysis of volatile organic compounds by sorbent tube/thermal desorption/capillary gas chromatography – Part 1: Pumped sampling*

ISO 16111:2008, *Transportable gas storage devices – Hydrogen absorbed in reversible metal hydride*

*United Nations Recommendations on the Transport of Dangerous Goods – Model Regulations; Sixteenth revised edition*

*United Nations Recommendations on the Transport of Dangerous Goods – Manual of Tests and Criteria; Fifth revised edition*