



**SLOVENSKI STANDARD**  
**oSIST prEN IEC 62282-3-202:2024**  
**01-april-2024**

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**Tehnologije gorivnih celic - 3-202. del: Nepremični elektroenergetski sistemi z gorivnimi celicami - Metode za preskušanje učinkovitosti za majhne energetske sisteme z gorivnimi celicami, ki jih je mogoče dopolniti z dodatnim generatorjem toplote za delovanje več enot s sistemom za upravljanje energije**

Fuel cell technologies - Part 3-202: Stationary fuel cell power systems - Performance test methods for small fuel cell power systems that can be complemented with a supplementary heat generator for multiple units operation by an energy management system

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**ICS:**

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# 105/1020/CDV

## COMMITTEE DRAFT FOR VOTE (CDV)

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SECRETARIAT: Germany	SECRETARY: Mr David Urmann
OF INTEREST TO THE FOLLOWING COMMITTEES: TC 8, TC 57, TC 120, SyC Smart Energy	PROPOSED HORIZONTAL STANDARD <input type="checkbox"/> Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.
FUNCTIONS CONCERNED: <input type="checkbox"/> EMC <input type="checkbox"/> ENVIRONMENT <input checked="" type="checkbox"/> QUALITY ASSURANCE <input type="checkbox"/> SAFETY	
<input checked="" type="checkbox"/> SUBMITTED FOR CENELEC PARALLEL VOTING <b>Attention IEC-CENELEC parallel voting</b> The attention of IEC National Committees, members of CENELEC, is drawn to the fact that this Committee Draft for Vote (CDV) is submitted for parallel voting. The CENELEC members are invited to vote through the CENELEC online voting system.	<input type="checkbox"/> NOT SUBMITTED FOR CENELEC PARALLEL VOTING

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TITLE:

**Fuel cell technologies – Part 3-202: Stationary fuel cell power systems – Performance test methods for small fuel cell power systems that can be complemented with a supplementary heat generator for multiple units operation by an energy management system**

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## FUEL CELL TECHNOLOGIES –

**Part 3-202: Stationary fuel cell power systems –  
Performance test methods for small fuel cell power systems that can be  
complemented with a supplementary heat generator for multiple units  
operation by an energy management system**

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IEC 62282-3-202 has been prepared by IEC technical committee 105: Fuel cell technologies. It is an International Standard.

The text of this International Standard is based on the following documents:

Draft	Report on voting
105/XX/FDIS	105/XX/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available

at [www.iec.ch/members\\_experts/refdocs](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/standardsdev/publications](http://www.iec.ch/standardsdev/publications).

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## INTRODUCTION

This part of IEC 62282 provides consistent and repeatable test methods for the electrical thermal and environmental performance of small stationary fuel cell power systems.

This document limits its scope to small stationary fuel cell power systems (electric power output below 10 kW) and provides test methods specifically designed for them in detail. It is based on IEC 62282-3-201.

For multiple units operation, each electric power output of the unit is limited to below 10kW.

This document is intended for manufacturers of small stationary fuel cell power systems and/or those who evaluate the performance of their systems for certification purposes.

Users of this document may selectively execute test items that are suitable for their purposes from those described in this document. This document is not intended to exclude any other methods.

This document describes type tests and their test methods only, in this document, no routine tests are required or identified, and no performance targets are set.

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## FUEL CELL TECHNOLOGIES –

### Part 3-202: Stationary fuel cell power systems – Performance test methods for small fuel cell power systems that can be complemented with a supplementary heat generator for multiple units operation by an energy management system

#### Scope

This document provides performance test methods specialized for the thermal and electrical characteristics which are required by an energy management system to effectively share the heat and power of networked small stationary fuel cell power systems. These test methods are applied for each small stationary fuel cell power system. This document covers small stationary fuel cell power systems which can be complemented with a supplementary heat generator and/or a thermal storage system such as:

output: rated electric power output of less than 10 kW for each system;

output mode: grid-connected/independent operation or stand-alone operation with alternating current (AC) output not exceeding 240 V or direct current (DC) output;

operating pressure: maximum allowable working pressure of less than 0.1 MPa (G) for the fuel and oxidant passages;

fuel: Gaseous fuel (natural gas, liquefied petroleum gas, propane, butane, hydrogen) or liquid fuel (kerosene, methanol);

oxidant: air.

This document does not apply to small stationary fuel cell power systems with electricity storage other than (small scale) back-up power for safety, monitoring and control.

Note: Regarding data linkage for conducting performance tests specified in this document with operating management systems (Energy Management System) of multiple Fuel Cell Power System (mFCPS), an appropriate IEC standard is recommended to select and implement. The related standards are IEC 61850-7-420, IEC 61850-90-27, IEC 62394 Ed4.0, IEC 62746-10-1, IEC 62746-10-3 Ed.1, etc. The data linkage and implementation for realizing the functions of the system that monitors mFCPS and peripherals differ depending on the vendor of the mFCPS control system, so the methods for data linkage and implementation are not specified in this document.

#### Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 62282-3-200:2015, *Fuel cell technologies – Part 3-200: Stationary fuel cell power systems – Performance test methods*

#### Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

IEC Electropedia: available at <http://www.electropedia.org/>

ISO Online browsing platform: available at <http://www.iso.org/obp>

60  
61 **cold state**  
62 state of a fuel cell power system at ambient temperature with no power input or output, ready  
63 for start-up

64 [SOURCE: IEC 60050-485:2020, 485-21-01, modified — "ready for start-up" added.]

65  
66 **electrical efficiency**  
67 ratio of the average net electric power output produced by a fuel cell power system to the  
68 average fuel power input supplied to the fuel cell power system

69 Note 1 to entry: The lower heating value (LHV) is assumed unless otherwise stated

70 [SOURCE: IEC 60050-485:2020, 485-10-02, modified — "electrical" instead of "electric" in the  
71 term; "average net electric power output" instead of "net electric power"; "average fuel power  
72 input" instead of "total enthalpy flow".]

73  
74 **electric energy input**  
75 integrated value of electric power input at the electric input terminal

76 [SOURCE: IEC 62282-3-201:2021, 3.8]

77  
78 **electric energy output**  
79 integrated value of electric power output at the electric output terminal

80 [SOURCE: IEC 62282-3-201:2021, 3.9]

81  
82 **electric power input**  
83 electric power input at the electric input terminal of the fuel cell power system

84 [SOURCE: IEC 62282-3-201:2021, 3.10]

85  
86 **electric power output**  
87 electric power output at the electric output terminal of the fuel cell power system

88 [SOURCE: IEC 62282-3-201:2021, 3.11]

89  
90 **fuel cell power system**  
91 generator system that uses one or more fuel cell modules to generate electric power and heat

92 [SOURCE: IEC 60050-485:2020, 485-09-01]

93  
94 **fuel input**  
95 amount of natural gas, hydrogen, methanol, liquid petroleum gas, propane, butane, or other  
96 material containing chemical energy entering the fuel cell power system while it is working at  
97 the specified operating conditions

98 [SOURCE: IEC 62282-3-201:2021, 3.13]

99  
100 **fuel power input**  
101 fuel energy input per unit of time

102 [SOURCE: IEC 62282-3-201:2021, 3.14]

103  
104 **heat recovery efficiency**  
105 ratio of the average recovered thermal power output of a fuel cell power system to the average  
106 total power input supplied to the fuel cell power system

107 [SOURCE: IEC 60050-485:2020, 485-10-04, modified — “the average recovered thermal power  
108 output” instead of “recovered heat flow”; “average total power input” instead of “total enthalpy  
109 flow”; Note 1 to entry deleted.]

110  
111 **heat recovery fluid**  
112 fluid circulating between the fuel cell power system and a heat sink for recovering the thermal  
113 energy output

114 [SOURCE: IEC 62282-3-201:2021, 3.16]

115  
116 **hot restart**  
117 start operation of the fuel cell power system before the power system temperature condition  
118 reach the “cold state”

119  
120 **inert purge gas**  
121 inert gas or dilution gas, not containing chemical energy, supplied to the fuel cell power system  
122 during specific conditions to make it ready for operation or shutdown

123 Note 1 to entry: Dilution gas containing chemical energy shall be considered as fuel.

124 [SOURCE: IEC 62282-3-201:2021, 3.17]

125  
126 **integrated fuel input**  
127 volume or mass of fuel consumed by the fuel cell power system under specified operating  
128 conditions

129 [SOURCE: IEC 62282-3-201:2021, 3.18]

130  
131 **interface point**  
132 measurement point at the boundary of a fuel cell power system at which material or energy, or  
133 both, either enters or leaves

134 Note 1 to entry: This boundary is intentionally selected to accurately measure the performance of the system,  
135 including all normal operation, both steady state and transient. If necessary, the boundary or the interface points of  
136 the fuel cell power system (Figure 1) to be assessed should be determined by agreement between the parties.

137 Note 2 to entry: Typical conditions to be standardized refer to fuel and oxidant parameters, like compositions, flow  
138 rates, temperature, pressure and humidity, as well as to the fuel cell parameters, like temperature.

139 [SOURCE: IEC 60050-485:2020, 485-09-12]

140  
141 **minimum electric power output**  
142 minimum net power output, at which a fuel cell power system is able to operate continuously at  
143 a steady state

144 [SOURCE: IEC 62282-3-201:2021, 3.21]

145  
146 **net electric power output**  
147 power generated by the fuel cell power system and available for external use

148 [SOURCE: IEC 60050-485:2020, 485-14-03, modified — “output” added to the term, Notes 1  
149 and 2 to entry deleted.]

150  
151 **rated electric power output**  
152 maximum continuous electric power output that a fuel cell power system is designed to achieve  
153 under normal operating conditions specified by the manufacturer

154 [SOURCE: IEC 60050-485:2020, 485-14-04, modified — “electric” and “output” added to the  
155 term, Note 1 to entry deleted.]

156  
157 **ramp-up energy**  
158 electric and/or chemical (fuel) energy required for transitioning from zero or minimum net  
159 electric power output to rated net electric power output

160 [SOURCE: IEC 62282-3-201:2021, 3.28, modified — “zero or minimum” instead of “positive”;  
161 “after start-up” deleted.]

162  
163 **ramp-up time**  
164 duration required for transitioning from zero or minimum net electric power output to rated net  
165 electric power output

166 [SOURCE: IEC 62282-3-201:2021, 3.29, modified — “zero or minimum” instead of “positive”;  
167 “after start-up” deleted.]

168  
169 **ramp-down energy**  
170 electric and/or chemical (fuel) energy required for transitioning from rated net electric power  
171 output to minimum or zero net electric power output

172  
173 **ramp-down time**  
174 duration required for transitioning from rated net electric power output to minimum or zero net  
175 electric power output

176  
177 **recovered heat**  
178 thermal energy that has been recovered for useful purpose

179 Note 1 to entry: The recovered heat is measured by determining the temperatures and flow rates of the heat recovery  
180 fluid (water, steam, air or oil, etc.) entering and leaving the thermal energy recovery subsystem at the interface point  
181 of the fuel cell power system.

182 [SOURCE: IEC 62282-3-201:2021, 3.30]

183  
184 **recovered thermal power**  
185 recovered heat per unit of time

186 [SOURCE: IEC 62282-3-201:2021, 3.31]

187  
188 **shutdown energy**  
189 sum of electric and/or chemical (fuel) energy required during the shutdown time

190 [SOURCE: IEC 62282-3-201:2021, 3.32]

191  
192 **shutdown time**  
193 duration between the instant when a shutdown action is initiated at rated electric power output  
194 and the instant when the cold state or storage state, as specified by the manufacturer, is  
195 attained