

# SURFACE VEHICLE RECOMMENDED PRACTICE

J2617 AUG2011

Issued 2007-11 Stabilized 2011-08

Superseding J2617 NOV2007

# Recommended Practice for Testing Performance of PEM Fuel Cell Stack Sub-system for Automotive Applications

### RATIONALE

The committee cannot find users for the technical report.

# STABILIZED NOTICE

This document has been declared "Stabilized" by the SAE Fuel Cell Standards Committee and will no longer be subjected to periodic reviews for currency. Users are responsible for verifying references and continued suitability of technical requirements. Newer technology may exist.

#### TABLE OF CONTENTS

1. 1.1	SCOPE	1 4
2.	REFERENCES	
2.1	Applicable Publications	
2.1.1	SAE Publications	
2.1.2	NIST Publication	
2.1.3	NFPA Publication	
2.1.4	ASME Publications	3
2.1.5	DOE/FETC Publication	3
2.1.6	CGA Publication	
2.2	Related Publications	3
2.2.1	SAE Publications	3
2.2.2	NIST Publication	7
2.2.3	NFPA Publications	7
2.2.4	CSA Publication	
2.2.5	ASTM Publication	7
2.2.6	ASME Publication	7
2.2.7	IEEE Publication	
3.	DEFINITIONS	7
3.1	Active Area	7
3.2	Air	3
3.3	Air Processing Sub-system (APS)	3
3.4	Anode	
3.5	Catalyst Coated Membrane (CCM)	3
3.6	Cathode	
3.7	Consistent Liquid or Gaseous Fuels	
3.8	Current Collector	
0.0		-

SAE Technical Standards Board Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user." SAE reviews each technical report at least every five years at which time it may be reaffirmed, revised, or cancelled. SAE invites your written comments and suggestions.

Copyright © 2011 SAE International

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of SAE.

TO PLACE A DOCUMENT ORDER:

Tel: 877-606-7323 (inside USA and Canada) Tel: +1 724-776-4970 (outside USA) Fax: 724-776-0790 Email: CustomerService@sae.org

Email: Customer http://www.sae.org SAE values your input. To provide feedback on this Technical Report, please visit <u>http://www.sae.org/technical/standards/J2617\_201108</u>

SAE	J2617 Stabilized AUG2011	Page 2 of 35
3.9	Electrical Load System	
3.10	Electrode	
3.11	Electrolyte	
3.12	Fuel Cell	
3.13	Fuel Cell Control System (FCCS)	
3.14	Fuel Cell Stack	
3.15	Fuel Cell Stack Sub-system (FCSS)	
3.16	Fuel Cell System (FCS)	
3.17	Fuel Processing Sub-system (FPS)	9
3.18	Fuel Supply System (FSS)	
3.19	Gas Diffusion Layer (GDL)	
3.20	Maximum Continuous Power	
3.20	Membrane Electrode Assembly (MEA)	
3.22	Open Circuit Voltage (OCV)	
3.22	Peak Power	
3.23	Power Conditioning System (PCS)	
3.24		
3.25	Power Distribution Sub-system (PDS)	
	Pressure and Temperature	
3.27	Proton Exchange Membrane (PEM)	
3.28	Proton Exchange Membrane Fuel Cell (PEMFC or PEFC)	
3.29	Reference Conditions	
3.30	Reformate Gas or Reformate	
3.31	Reliability	
3.32	Separator Plate	
3.33	Stack Sub-system Temperature	
3.34	Test Facility	
3.35	Test Reading	
3.36	Test Run	
3.37	Test Stand	
3.38	Test Article	
3.39	Testing Parties	
3.40	Test Operator(s) / Personnel	
3.41	Thermal Equilibrium Condition	
3.42	Thermal Equivalence Condition	
3.43	Thermal Management Sub-system (TMS)	
3.44	Vehicle Control System (VCS)	
3.45	Water Treatment Sub-system (WTS)	
3.46	Test Operating Conditions (TOC)	
4.	NOMENCLATURE, PHYSICAL CONSTANTS AND UNITS	
4.1	Physical Characteristics	
4.2	Controlled and/or Measured Parameters	
4.3	Calculated or Estimated Parameters	
5.	PRE-TEST CONDITIONS	13
5.1	Definition of Test Article with Schematic	
5.1.1	Test Boundary and Specifications of Test Article	
5.2	Specifications for Test Facility and Equipment	
5.2.1		
	Gas/Flame Detection System	
5.2.2 5.2.3	Facility Ventilation	
	Shutdown Precautions	
5.2.4	Purge Gas Storage and Supply System	
5.2.8		
5.2.9	Test Stand Requirements	17
5.2.5 5.2.6 5.2.7 5.2.8	Fuel Storage and Supply System Oxidant Storage and Supply System Coolant Storage and Supply System Data Acquisition and Timing Equipment	

5.2.10	Test Equipment Calibration	17
5.2.11	Pretest Records	17
5.3	Inspection of Test article and Connections to Facilities and Equipment	
5.3.1	Inspection of Test Article	
5.3.2	Measurement of Mass and Volume	
5.3.3	Leak Detection and Gas Purging	
5.3.4	Electrical Connections	
5.3.5	Functional Check	
5.4	Pretreatment Procedures.	
5.4.1	Conditioning and Cell Shorting	
5.5	Startup and Shutdown Procedures	
5.6	Test Plan	
5.6.1	General	
5.7	Training of Test Personnel	
5.8	Agreements	
6.	TEST SEQUENCE DESCRIPTION	
6.1	OCV Test	
6.2	Polarizations	
6.2.1	H <sub>2</sub> /Air Polarization at Test Operating Conditions	
6.2.2	$H_2/Diluted O_2$ Polarization at Test Operating Conditions	
6.2.3	Dilute $H_2$ /Air Polarization at Test Operating Conditions	
6.3	Sensitivity Sweeps	
6.3.1	Fuel Stoichiometry Sweep on $H_2/Air$	
6.3.2	Air Stoichiometric Ratio Sweep on $H_2/Air$	
6.3.3	Coolant Flow Rate Sweep on H <sub>2</sub> /Air	
6.3.4	Coolant Inlet Temperature Sweep on H <sub>2</sub> /Air	
6.3.5	Cotlant linet remperature Sweep on H <sub>2</sub> /Air	
6.3.6	Cathode Inlet Pressure Sweep on H <sub>2</sub> /Air	
6.3.7	Anode Inlet Dew Point Sweep on H <sub>2</sub> /Air	
6.3.8		
	Anode Inlet Pressure Sweep on H <sub>2</sub> /Air Response to Holding of Load	
6.4		
6.4.1	Holding Load on H <sub>2</sub> /Air at 0.10 A/cm <sup>2</sup>	
6.4.2	Holding Load on H <sub>2</sub> /Air at 0.80 A/cm <sup>2</sup>	
6.5	Dynamic Response on $H_2/Air$	
6.5.1	Step Change to Load on $H_2$ /Air from 0.20 A/cm <sup>2</sup> to 0.80 A/cm <sup>2</sup>	
6.5.2	Ramp Change to Load on H <sub>2</sub> /Air from 0.20 A/cm <sup>2</sup> to 0.80 A/cm <sup>2</sup> at a Rate of 0.06 A/cm <sup>2</sup> /sec	
7.	DATA ACQUISITION, ANALYSIS AND REPORTING	
7.1	Data Management	
7.1.1	Storage of Data	
7.1.2	Manually Collected Data	
7.1.3	Validity of Results	
7.1.4	Test Records and Results	
7.2	Formulas and Calculations	
7.2.1	Stack Sub-system Current Density and Average Cell Voltage	
7.2.2	Stack Sub-system Electrical Power Output	
7.2.3	Stack Sub-system Efficiency	
7.3	Report Format	
7.3.1	General Requirements	
7.3.2	Title Page	
7.3.3	Executive Summary	
7.3.4	Introduction	
7.3.5	Approach	
7.3.6	Results	
7.3.7	Conclusions	
7.3.8	Appendices	
1.0.0	, the union and the second s	