SURFACE VEHICLE RECOMMENDED PRACTICE

J1171™	FEB2023

Issued 1977-09
Revised 1982-08
Reaffirmed 2023-02

Superseding J1171 SEP2016

External Ignition Protection of Marine Electrical Devices

RATIONALE

SAE J1171 has been reaffirmed to comply with the SAE Five-Year Review policy.

1. ***Scope***—This SAE Recommended Practice covers all electrical devices suitable for use in marine engine compartments and fuel tank spaces.

1.1 **Purpose**—To recommend a test procedure for certifying the External Ignition Protection of electrical devices used on boats.

2. ***References***—There are no referenced publications specified herein.

3. ***General***—A device shall not produce combustion by excessive external surface temperature or by an internally generated arc. Reproducible test procedures are necessary to ensure that neither condition can cause external ignition when the particular electrical device is being operated.

In the first case, which involves excessive external surface temperatures, a test procedure includes operation for a minimum time at a higher-than-rated system voltage (or current) level with a limiting external surface temperature value. This should assure that such a device is acceptable for use in an engine compartment or fuel tank space. This test procedure is detailed in Section 4.

In the second case, which involves devices containing parts capable of arcing, two test approaches are necessary since such devices may be either sealed or non-sealed. Those that are sealed are External Ignition Protected by the fact that a combustible mixture cannot enter the void in which the arc occurs. Therefore, the test of sealed devices is a test of the seal integrity. This test is detailed in Section 5.

Non-sealed devices are External Ignition Protected when tests demonstrate that ignition of a combustible mixture within the device does not cause ignition of a combustible mixture surrounding the device. This will be verified by 50 device explosions with the flammability of the mixture within the enclosing chamber being checked by a chamber explosion after each 10 device explosions as detailed in Section 6.

The test sequence for any device is:

a. Section 4—Device Operation
b. Section 5—Sealed Devices
c. Section 6—Non-Sealed Devices

This is to ensure that any deficiency introduced in the device by the Operation Test Procedure, such as seal deterioration, etc., can be detected in the following tests.

SAE Executive Standards Committee 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 revised, reaffirmed, stabilized, or cancelled. SAE invites your written comments and suggestions.

Copyright © 2023 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
SAE WEB ADDRESS: http://www.sae.org

For more information on this standard, visit
https://www.sae.org/standards/content/J1171_202302/

Documents
Document Sharing Hub

Full document details: SAE J1171_202302

4. Continuous Device Operation to Determine External Surface Temperatures

4.1 Electrical devices not rated for continuous operation and wired with manually operated momentary switches are exempt from this test procedure. This includes devices such as engine cranking motors, propulsion unit trim motors, and other intermittently operated devices.

4.2 This test shall be run with the device in an air circulating oven having an initial temperature of 60 °C ± 2 °C (140 °F ± 4 °F).

4.3 The device shall be operated continuously for a minimum of 7 h in the mode in which it draws its maximum current.

4.4 The test voltage supply shall be adjusted to 120% of the nominal system voltage (such as 12 or 115 V).

4.5 The maximum allowable surface temperature is 200 °C (392 °F) measured at any point on the device's exterior.

5. Method of Test—Sealed Devices

5.1 Equipment Description—Refer to Figure 1.

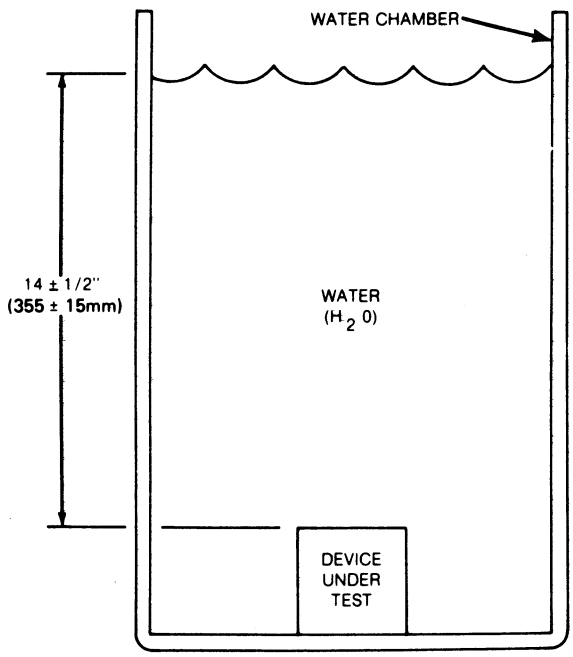

FIGURE 1—TEST ASSEMBLY (SEALED DEVICES)

Documents
Document Sharing Hub
Full document details: SAE J1171_202302

5.2 Test Procedure

5.2.1 Submerge the device to be tested in a chamber of water, changing its attitude if necessary so that all possible sources of leaks are at the top and are 355 mm ± 15 mm (14 in ± 0.5 in) below the surface of the water. Submerged time is 15 min for each attitude change.

5.2.2 Observe the device under test carefully during the test duration for a leak as evidenced by the generation of a bubble or stream of bubbles.

5.2.3 If bubbles are observed coming out of the electrical portion of the device, the devices shall not be considered a sealed device and shall be tested under Section 6.

5.2.4 If no bubbles are observed, remove the device from the water chamber and dry its exterior.

5.2.5 Disassemble the device for internal inspection.

5.2.6 If no water is found inside the device, it shall be accepted as external ignition protected. If water is found, it shall be tested under Section 6.

6. Method of Test—Non-Sealed Devices

6.1 Equipment Description—See Figures 2 and 3. Special note should be taken of the pressure-relief lid arrangement.

6.2 Device Preparation

6.2.1 Provide means of introducing a combustible mixture of propane and air into the device via 150 mm (6 in) minimum length of rigid or flexible tubing having an ID of 1.5 to 6.35 mm (1/16 to 1/4 in), the selection to be based on the minimum ID that can maintain a test rate which allows a minimum of two device ignitions per minute. The tubing supplying the mixture sample from the device to the analyzer shall have a 1.5 mm (1/16 in) ID and a minimum length of 150 mm (6 in). (Utilizing the minimum ID minimizes the effect of reducing the combustion pressure within the device at the time of ignition and maximizes the severity of the test.) See Figure 2.

6.2.2 Devices that do not contain openings large enough to permit the introduction of the mixture at the required rate shall have a vent in the form of a copper tube with a 150 mm (6 in) minimum length installed in the device with the free end open to the chamber. The ID of the copper vent shall be the same as that required to feed the device.

NOTE—The copper material is necessary to assure quenching of the flame before it reaches the end open to the chamber.

6.2.3 Devices which are too small for the direct installation of both the tubing feeding the device and that supplying the device gas analyzer require a tee fitting to join the tubes from which a single 150 mm (6 in) minimum length, 1.5 mm (1/16 in) ID, rigid or flexible tubing can then enter the device. See Figure 3.

6.2.4 The device contacts or a separately mounted spark plug or spark plug-like item is required to provide a gap across which a spark can jump. The gap size need only be large enough to ignite consistently the specified mixture. However, where possible, a 2.54 mm (0.100 in) gap is preferred. The spark gap provided must be installed as close as possible to that part in the device from which the arc would normally originate. Electric motors, for example, must have a spark plug mounted at the commutator end of the motor since it is at this end that sparks between the brushes and commutator can occur. The test chamber ignition system shall be a single-shot system to insure that the surrounding mixture is easily ignitable.

Documents
Document Sharing Hub
Full document details: SAE J1171_202302