



<b>SURFACE VEHICLE STANDARD</b>	<b>J2913™</b>	<b>JAN2025</b>
	Issued	2011-02
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Superseding J2913 OCT2016		
R-1234yf [HFO-1234yf] Refrigerant Electronic Leak Detectors, Minimum Performance Criteria		

## RATIONALE

SAE J2913 is the result of a Five-Year Review and update of the specification.

### 1. SCOPE

This SAE Standard provides testing and functional requirements to meet specified minimum performance criteria for electronic probe-type leak detectors. The equipment specified here will identify smaller refrigerant leaks when servicing motor vehicle air conditioning systems, including those engineered with improved sealing and smaller refrigerant charges to address environmental concerns and increase system efficiency. This document does not address any safety issues concerning the equipment design or use beyond that of sampling a flammable refrigerant, save those described in 3.1 and 3.2 of this document. All requirements of this standard shall be verified in SAE J2911.

#### 1.1 Purpose

The purpose of this SAE Standard is to establish minimum performance criteria for a modern class of electronic probe-type leak detectors intended for use in automotive air conditioning systems with R-1234yf, an A2L flammable refrigerant.

#### 1.2 Grace Period

This revision is subject to a 0-day grace period from the date of publication. After the grace period, only the most recent version of this standard may be used for certification and/or recertification. To certify equipment to the prior version of this standard, actual laboratory testing, not merely the signing of a contract, etc., must have begun prior to the publication date of this new version. No laboratory certification to any prior version of this standard shall be accepted by SAE for listing under the provisions of SAE J2911 after 90 days from the publication date of this revision.

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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.

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## 2. REFERENCES

### 2.1 Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

#### 2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), [www.sae.org](http://www.sae.org).

- |           |  |
|-----------|--|
| SAE J639  | Safety and Design Standards for Motor Vehicle Refrigerant Vapor Compression Systems  |
| SAE J1739 | Potential Failure Mode and Effects Analysis (FMEA) Including Design FMEA, Supplemental FMEA-MSR, and Process FMEA  |
| SAE J2791 | HFC-134a Refrigerant Electronic Leak Detectors, Minimum Performance Criteria   |
| SAE J2845 | R-12 (CFC-12), R-134a (HFC-134a), R-1234yf (HFO-1234yf), R-744, and R-152a (HFC-152a) Technician Training for Service and Containment of Refrigerants Used in Mobile A/C Systems |
| SAE J2911 | Procedure for Certification that Requirements for Mobile Air Conditioning System Components, Service Equipment, and Service Technician Training Meet SAE J Standards             |

#### 2.1.2 UL Publications

Available from UL, 333 Pfingsten Road, Northbrook, IL 60062-2096, Tel: 847-272-8800, [www.ul.com](http://www.ul.com).

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|-----------|---|
| UL 121201 | Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations |
|-----------|---|

### 2.2 Related Publications

The following publications are provided for information purposes only and are not a required part of this SAE Technical Report.

#### 2.2.1 CSA Group Publications

Copies of these documents are available online at <https://www.csagroup.org/store/>.

- |                             |  |
|-----------------------------|--|
| C22.2 No. 213-17 (or newer) | Nonincendive electrical equipment for use in Class I and II, Division 2 and Class III, Divisions 1 and 2 hazardous (classified) locations (Binational standard with UL 121201) |
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## 3. TECHNICAL REQUIREMENTS

- 3.1 The detector shall be tested to meet the performance specifications of this standard by an independent testing facility as defined in SAE J2911 and in accordance with the procedures set forth in SAE J2911. The independent testing facility shall maintain all documentation related to its testing, including calibration and maintenance data for its equipment, for a period of 5 years following the test of the specific detector.
- 3.1.1 The manufacturer may state certification of compliance with this standard (including use of any labeling) only after meeting the requirements in SAE J2911. See Appendix B.
- 3.1.2 To certify pre-production or prototype units as defined in SAE J2911, they shall not be marketed with a label indicating that they meet the appropriate SAE Standard until the following requirement is met. The SAE label shall not be applied to these units until the independent laboratory has confirmed that the manufacturer has made, in 1 month's serial production, at least 150 completed serial production units.

- 3.2 The detector shall be suitable for use in safely identifying R-1234yf, an A2L flammable refrigerant. As a safety factor against use of a more flammable refrigerant in vehicle service, the marketer shall certify that at peak sensitivity, the temperature anywhere within the detector does not exceed 400 °C (752 °F) so that ignition cannot occur. This shall be verified by prolonged exposure of any component subject to producing high temperature to a flammable propane-air mixture, such as from a propane torch.
- 3.2.1 If any components may operate at that temperature or above, they shall meet UL 121201 and/or be enclosed or housed in a location within the detector that will, in case of separation at any connections within the refrigerant sampling flow route, prevent refrigerant from coming into contact with same.
- 3.2.2 If any components, such as switches, solenoids, and motors, come into contact with the refrigerant sample, they shall be of arc-suppression design as specified in UL 121201.
- 3.2.3 The detector shall be suitable for use in an automotive service garage and operate in ambient temperatures of 15 to 49 °C (59 to 120 °F).
- 3.3 The detector shall have at least three scales that can be manually selected: (1) 4 g/yr (0.15 oz/yr); (2) 7 g/yr (0.25 oz/yr); (3) 14 g/yr (0.5 oz/yr).
- 3.4 If it passes, the detector shall carry a label that states “Design certified by (name of independent testing laboratory)” to meet SAE J2913 with lettering in boldface type at least 3 mm high.
- 3.5 If it does not pass, the detector may be retested subject to the limits of Section 10. If a detector fails beyond these retest limits, it may be retested only after the marketer has documented changes made to correct the failure and given the data to the independent testing laboratory. A detector shall pass the procedures in Sections 7 and 8. A failure in either or both of those sections requires a complete retest. The detector also shall meet the requirements of Section 9, passing the no-false-triggering requirement for transmission oil and engine oil (Nos. 14 and 15) and clearing within 20 seconds after a permitted false-trigger.

#### 4. WHAT SHALL ACCOMPANY THE DETECTOR

- 4.1 The marketing company shall provide operating instructions for the detector that cover calibration, normal usage, maintenance, troubleshooting, and spare parts.
- 4.2 Tools, adapters, and needed adjustment and calibration devices (including calibration and/or reference bottles) for the detector shall be included with the detector.
- 4.3 The marketing company shall provide all needed safety information and labeling.
- 4.4 The marketing company shall provide the Section 10 list of all common under hood chemicals that may affect the operation of an electronic leak detector and indicate by Y if this detector will false-trigger from exposure to each of the chemicals on the list, or N if it will not false-trigger.
- 4.5 The resistance to false-triggering shall be based on the test procedures described in Section 9. False-triggering is defined as the detector making the same or similar indication (sound and/or light) as if it detected a refrigerant leak.

#### 5. REQUIRED BASIC FUNCTIONS

- 5.1 The detector may self-calibrate or require manual calibration, but once calibrated for an operation, it shall hold that calibration for a time sufficient to perform the operations described in Sections 7 and 8 (including 8.1 to 8.6). This does not preclude automatic recalibration for a probe that has been inserted into a contaminated atmosphere (as per Section 8), readjustment of sensitivity by operator selection, or an audible-and-or-visual warning of a condition beyond the operating scope of its design. The latter shall be obviously different from the indication of a refrigerant leak, although the same functional trigger may be used. Example: a steady indicator light versus a flashing indicator light.

- 5.2 The detector shall demonstrate automotive garage durability by continuing to function normally after being dropped 1.2 m (4 feet) to a hard surface, such as a concrete floor, four times. This test may be performed with the detector in a protective caddy, provided the caddy is a standard part of the basic detector kit, and does not affect in-shop use of the detector, or testing of the detector under all procedures in Sections 7, 8, 9, and 10.
- 5.3 The detector shall demonstrate automotive garage durability by continuing to function normally after being turned on and
- 5.3.1 The probe tip has been submerged to a depth of 6 mm (0.25 inch) in a pan of water and drawn through the water at a rate of 75 mm/s (3 in/s) for 2 seconds and
- 5.3.2 Then, after wiping clean and given any other cleaning/maintenance prescribed by the manufacturer in its operating instructions manual, including but not limited to a sensor replacement or filter change.

## 6. LEAK DETECTION TEST EQUIPMENT

- 6.1 The testing shall be performed with the probe in a 610-mm (2-foot) cube clear sealed chamber as described in Appendix A, Figures A1 and A2. A chamber built to conform to SAE J2791 is suitable.
- 6.1.1 Illustrations and details of the chamber are described in Appendix A. A vertical wall of the chamber shall have a slot 200 mm (8 inches) wide or wider, and large enough for a probe from an externally mounted detector to go through. The slot opening shall be sealed with
- 6.1.2 Overlapping strips of a rubber material that conforms sufficiently around the probe to maintain the specified level of contaminated atmosphere, or
- 6.1.3 A butt joint of conforming rubber seals with additional sealing from face seals on the detector probe neck that are in contact with the butt joint.
- 6.1.4 Any other slot sealing method that provides the chamber sealing required for Section 8.

The rubber strips and face seals may be lubricated to provide smooth movement of the probe and any surrounding brace as described in 6.2.

- 6.1.5 The chamber shall have an access door large enough to insert a calibrated leak standard, a cylindrical sleeve or round-hole access point for a gas-tight syringe, and a built-in mixing fan (120 V, approximately 40 cfm) to circulate an injection of refrigerant gas to produce uniform distribution of injected gas for a contaminated atmosphere test. The chamber should have a provision for attaching a vacuum source (such as a small household vacuum motor) to permit rapid clearing of the chamber following a contaminated atmosphere test. The cylindrical sleeve or round-hole access shall include a sealing plug or other provision for sealing following use of the gas-tight syringe.
- 6.1.6 The four calibrated leak standards used for the tests shall be calibrated per methods and instruments per the National Institute of Standards and Technology, Washington, DC 20234, and the standards shall be rated accurate to within  $\pm 20\%$ . The leak rates shall be in common units -14 g/yr (0.5 oz/yr), 7 g/yr (0.25 oz/yr), 4 g/yr (0.15 oz/yr), and 2 g/yr (0.0625 oz/yr). The leak standards shall contain 100% R-1234yf. The standards or their mounting locations in the chamber shall ensure the base of the standard is 75 mm (3 inches) or more from the floor of the chamber. This is to provide a sufficient drop for refrigerant coming from the leak standard orifice, to minimize refrigerant puddling around the orifice and/or orifice shroud if used. To mitigate testing inconsistency from possible air turbulence caused by the moving probe, the leak standards may be equipped (as a certification test option) with a shroud around the orifice port. The shroud protrusion from the orifice port shall be no more than 6 mm  $+0/-0.2$  mm (0.236 inch  $+0/-0.01$  inch). A view of a sample configuration, with dimensions within those ranges, is shown in Appendix A as Figure A3. If a shroud is used with any leak standard, this shroud also shall be used with all other leak standards for certification of a detector. This shall be verified that the calibrated leak standards have been tested as accurate and have not been tampered with in any way.

- 6.1.7 The detector shall be mounted on a table with a moving platform, designed to produce a horizontal reciprocating motion of at least 150 mm (6 inches), and a motor drive adjusted to move the platform so the probe tip passes the specified calibrated leak at a rate of 75 mm/s (3 in/s), from a distance of 9.5 mm (3/8 inch) per 7.2. All moving probe tests in this standard shall be performed at that rate as the probe passes the orifice of the calibrated leak standard. The platform shall stop at each end of its travel for no less than 8 seconds, no more than 10 seconds. The stop may be manually controlled by a test operator or performed automatically with a switch at each end-of-travel and a timer. A table that was built to conform to requirements for SAE J2791 is suitable.
- 6.2 It is necessary to hold steady the detector's flexible neck and probe, as the detector probe moves side to side through the sealed slot in the vertical wall of the chamber. If the design of the flex neck requires, this may be done by adding to the platform a brace (may be C or U channel) sized to hold the flex neck and probe securely, and long enough to protrude through the slot to within a distance conveniently short of the 9.5 mm (3/8 inch) from the orifice of the calibrated leak.

## 7. DETECTOR REQUIRED PERFORMANCE AND TEST PROCEDURE

- 7.1 Begin all testing for a single detector with a chamber cleared of refrigerant from any previous testing. Give the calibrated leak standard any maintenance/cleaning prescribed by the manufacturer. Perform the leakage rate tests separately, with the specific calibrated leak standard in the same position within the chamber. Position the calibrated leak standard so its orifice is at the exact midpoint of the moving platform's travel.
- 7.2 Adjust the detector and probe position for all tests so detector and probe are at one extreme end of the test table sweep. The probe shall sense three leakage rates of 4 g/yr (0.15 oz/yr), 7 g/yr (0.25 oz/yr), and 14 g/yr (0.5 oz/yr) when moved at a rate of 75 mm/s (3 in/s) past a calibrated leak standard, coming no closer than 9.5 mm (3/8 inch) from the orifice of the calibrated leak. The 9.5 mm (3/8 inch) distance from the orifice of the calibrated leak standard shall be horizontal or up to 45 degrees downward offset. Under these same operating conditions, the detector also shall not indicate a leak of 2 g/yr (0.0725 oz/yr) leak with the detector sensitivity selector in the 4 g/yr (0.15 oz/yr) position, a 4 g/yr (0.15 oz/yr) leak with the sensitivity selector in the 7 g/yr (0.25 oz/yr) position, and a 7 g/yr (0.25 oz/yr) leak with the sensitivity selector in the 14 g/yr (0.5 oz/yr) position.
- 7.2.1 Begin with the calibrated leak standard for 2 g/yr (0.0725 oz/yr) in position. Warm up the detector, select 4 g/yr (0.15 oz/yr), and operate the moving table so the probe sweeps past the calibrated leak standard a total of ten times (five side to side and back again movements at the specified rate and distance from the orifice). The probe shall indicate no leak nine of ten times, or the leak detector fails.
- 7.2.2 Replace the 2 g/yr (0.0725 oz/yr) calibrated leak standard with the 4 g/yr (0.15 oz/yr) calibrated leak standard. Operate the moving table so the probe sweeps past the calibrated leak standard orifice a total of ten times (five side to side and back again movements). The probe shall sense the leak within 2 seconds and clear within 2 seconds of passing the orifice, at least nine of the ten times. "Clear" is defined as a clearly audible reduction in sound and/or substantial decrease in indicator lighting from the indication of a leak. If after an apparent "Clear," the detector sounds in the stop period at each end of travel, following any one of the ten sweeps past the calibrated leak standard, the leak detector fails.
- 7.2.3 Immediately following the 4 g/yr (0.15 oz/yr) test, move the detector sensitivity selector to the 7 g/yr (0.25 oz/yr) position and perform a ten-sweep test with the 4 g/yr-calibrated leak standard still in position. The detector shall indicate no leak at least nine of ten times, or it fails.
- 7.3 Replace the 4 g/yr (0.15 oz/yr) calibrated leak standard with the 7 g/yr (0.25 oz/yr) calibrated leak standard and leave the detector sensitivity selector in the 7 g/yr (0.25 oz/yr) position. Perform a ten-sweep test and the detector shall indicate a leak within 2 seconds of passing the calibrated leak standard orifice, then clear within 2 seconds, at least nine of the ten times, or it fails.
- 7.4 Immediately following the 7 g/yr (0.25 oz/yr) test, leave the 7 g/yr (0.25 oz/yr) calibrated leak standard in position and move the detector sensitivity selector to the 14 g/yr (0.5 oz/yr) position. Perform a ten-sweep test and the detector shall indicate no leak at least nine of the ten times, or it fails.

7.5 With the detector sensitivity selector remaining in the 14 g/yr (0.5 oz/yr) position, replace the 7 g/yr (0.25 oz/yr) calibrated leak standard with a 14 g/yr (0.5 oz/yr) calibrated leak standard. Perform a ten-sweep test and the detector shall indicate a leak within 2 seconds of passing the calibrated leak standard orifice, then clear within 2 seconds, at least nine of the ten times, or it fails.

## 8. DETECTOR REQUIRED PERFORMANCE IN A CONTAMINATED ATMOSPHERE

Test for detector clearing in a contaminated atmosphere and then sensing a 4 g/yr (0.15 oz/yr) leak. This test shall be performed with the 4 g/yr (0.15 oz/yr) calibrated leak standard in the chamber, replacing the 14 g/yr (0.25 oz/yr) calibrated leak standard.

8.1 The probe of a self-clearing detector (turned off) shall remain in the chamber, to test its ability to clear in a contaminated atmosphere. Inject a volume of R-1234yf (amount sufficient to produce 500 ppm in the chamber) with a gas-tight syringe through the cylindrical access, into the chamber, seal the cylindrical access and mix the refrigerant with the air in the chamber by operation of the mixing fan for 4 to 5 minutes. Monitor the refrigerant contamination in the chamber, using a refrigerant monitor with accuracy of within  $\pm 10\%$  as rated by the manufacturer. Accuracy shall ensure the laboratory will be able to determine the chamber atmosphere is within the required contaminated atmosphere ranges of this section during the testing. The contaminated atmosphere shall be in the range of 450 to 550 ppm at the start (60 seconds after the mixing fan is turned off) and shall remain above 50% of that initial level at the conclusion of the sweep test. The refrigerant monitor shall be of verified accuracy, tested by the certifying laboratory prior to use, so its accuracy for the test procedure is assured.

8.2 Turn on the self-clearing detector, set to 4 g/yr (0.15 oz/yr) sensitivity and allow it to warm up. Once the detector is warmed up, shut off the mixing fan for the contaminated atmosphere test. The detector shall clear in the contaminated atmosphere within 60 seconds after the mixing fan has stopped, or it fails.

8.3 If the detector is not a self-clearing type but can be cleared within the chamber by manual adjustment, turn on the detector, set to 4 g/yr sensitivity, and allow to warm up. Shut off the mixing fan and immediately perform the manual clearing adjustment. The detector shall clear in the contaminated atmosphere within 60 seconds after the mixing fan has stopped, or it fails.

8.4 If the detector is designed to clear only with a calibration bottle, perform that procedure, inject the R-1234yf into the chamber and mix with the mixing fan for 4 to 5 minutes. Shut off the fan. Wait 60 seconds and insert the detector probe into the chamber. The detector shall not indicate any leak. If it does, it fails.

8.5 Follow the contaminated atmosphere test immediately with a ten-sweep moving probe test (minimum gap of 9.5 mm or 3/8 inch, at a rate of 75 mm/s or 3 in/s) with the 4 g/yr calibrated leak standard.

8.6 The probe shall indicate the leak within 2 seconds of passing the calibrated leak standard orifice from the 9.5 mm (3/8 inch) distance and clear within 2 seconds, at least nine of ten times, or it fails.

## 9. TESTING FOR CERTIFICATION OF A SERIAL PRODUCTION UNIT FROM BLIND PURCHASE ACQUISITION

When testing a serial production unit per SAE J2911, the detector shall be permitted to pass with the following tolerances allowed from the detection/alarm and detection/no alarm tests in Sections 7 and 8. The readjustments for these tolerances shall be made by the laboratory technician from the specified setting on the same calibrated leak standards, for which the independent testing laboratory has obtained accuracy assurance per SAE J2911.

On the high-sensitivity setting (4 g/yr), the detector shall pass if it detects at as high as 4.4 g/yr, including for the contaminated atmosphere test. On the mid-sensitivity setting (7 g/yr), the detector shall pass if it detects at 7.5 g/yr. On the low-sensitivity setting (14 g/yr), the detector shall pass if it detects at 14.5 g/yr. For the no-detect testing, it may pass on the highest-sensitivity setting with the calibrated leak standard reset from 2 g/yr to 1.8 g/yr. Other tests carry no tolerance.

## 10. FALSE-TRIGGERING OF THE DETECTOR

It is recognized that an electronic leak detector may falsely indicate a leak in the presence of certain under hood chemicals. Therefore, the detector shall be tested against the following substances, using the procedures described or equivalent. If substances other than specified are used, the laboratory shall ensure they are chemically equivalent and maintain records of the substitution in the SAE J2913 certification documentation.

Although false triggering is allowed by this standard for many chemicals, it is not allowed for mineral engine oil or transmission oil. The marketer of the leak detector shall list all the chemicals and by a Y or N in an adjacent box, indicating if the detector will or will not false-trigger from each chemical. That list shall be included with the leak detector, such as in the instruction manual.

If a detector's probe false-triggers from a permitted chemical, it shall immediately be removed, and to pass the test, the detector shall clear in no more than 20 seconds. The detector shall be fully warmed up and set for 4 g/yr (0.15 oz/yr) sensitivity prior to a false-triggering test. In all cases the detector probe shall be brought gradually to the surface of the chemical until/if it false-triggers, but no closer than within 3/8 inch (9.5 mm), and held there for a minimum of 5 seconds. If it false-triggers, it shall immediately be pulled out of the beaker, or a short distance (approximately 75 mm or 3 inches or more) away from the chemical if on a brush or dish. It shall clear within 20 seconds after being pulled away, or it fails the test. All tests shall be performed at 15 to 27 °C (60 to 80 °F) with chemicals in this temperature range except as noted, and in still air.

Each false-trigger test shall be performed four times, and the detector shall not false-trigger any of the four times to be listed as an N (no false-trigger).

If the detector is of a design that requires movement to generate a voltage change in order to alarm, the probe shall be moved across the chemical sample at a rate of 25 mm/s (1 in/s) from a distance of 9.5 mm (3/8 inch). The independent testing laboratory may use the moving table platform for this purpose.

The manufacturer of the detector shall explain in the operating instructions that if the detector takes longer than 2 seconds to clear as a result of exposure to one of the chemicals in this section (up to the test limit of 20 seconds); this indicates the probe apparently has encountered a large sample of contaminant, not necessarily a refrigerant leak. The instructions should add that the test area should be inspected for one of the permitted chemicals on the false-trigger list.

1. Windshield washer solvent with a freeze protection of at least 0 °F (methanol base). Pour into a beaker or petri dish.
2. Ford spot and stain remover (non-chlorinated) (Motorcraft ZC-14). Pour into a beaker or petri dish.
3. Rust penetrant and inhibitor (WD-40). Spray from aerosol onto a dish surface until there is a liquid accumulation.
4. Permatex 85420 fuel-resistant gasket dressing. Extrude a bead 50 mm (2.0 inches) or longer onto dish surface. Unthread and remove cap with brush holding a thick film of the liquid for test.
5. Permatex or Loctite Natural Blue cleaner and degreaser (biodegradable, non-caustic, with no chlorinated solvent, no petroleum solvent, no phosphate). Pour into a beaker or petri dish.
6. CRC Brakleen Non-Chlorinated Parts Cleaner - aerosol non-chlorinated brake parts cleaner. Spray from aerosol onto a dish surface until there is a liquid accumulation.
7. Motorcraft TA-32 (clear silicone rubber). Extrude bead 50 mm (2 inches) or longer onto a dish surface.
8. Zerex or Motorcraft G-05 anti-freeze/coolant. Pour into a beaker or petri dish. Heat the coolant to 66 to 82 °C (150 to 180 °F).
9. Gunk Liquid Wrench petroleum-based penetrant. Pour into a beaker or petri dish.

10. GoJo Natural Orange Pumice/Lotion hand cleaner (petroleum distillate, alcohol). Extrude from container onto a dish.
11. Mobile Conventional DOT3 brake fluid. Pour fluid into beaker or petri dish.
12. CRC Clean R Carb Non-chlorinated carburetor parts cleaner. Spray from aerosol onto a dish surface until there is a liquid accumulation.
13. Motorcraft XG-8 PTFE Silicone lubricant. Extrude bead 50 mm (2 inches) or longer onto dish surface.
14. Dexron IV Automatic transmission fluid heated to 66 to 82 °C (150 to 180 °F). Pour into a beaker or petri dish.
15. Mobile Conventional 5W30 mineral engine oil heated to 66 to 82 °C (150 to 180 °F). Pour into a beaker or petri dish.

#### 11. REPEATING A TEST PROCEDURE AFTER A FAILURE

If a detector fails only one ten-sweep test against a calibrated leak standard but passes all the other sweep tests, that one procedure may be repeated once. However, if it fails a second time, the entire series of certification tests to this standard shall be repeated, but not until the marketer has provided documentation to the test facility of changes made to the detector.

If a detector passes all the sweep tests but fails a not permitted false-triggering test (either by false-triggering on engine or transmission oil, or by failing to clear from another chemical false trigger within 20 seconds), it may be retested against that chemical again, only at the conclusion of all other tests. If it fails a second time, it may not be retested until the marketer has provided documentation to the test facility of changes made to the detector, and in that case, the entire series of certification tests to this standard shall be repeated.

#### 12. NOTES

##### 12.1 Revision Indicator

A change bar (I) located in the left margin is for the convenience of the user in locating areas where technical revisions, not editorial changes, have been made to the previous issue of this document. An (R) symbol to the left of the document title indicates a complete revision of the document, including technical revisions. Change bars and (R) are not used in original publications, nor in documents that contain editorial changes only.

PREPARED BY SAE INTERIOR CLIMATE CONTROL SERVICE COMMITTEE

## APPENDIX A - TEST CHAMBER DESIGN

The sealed chamber shall be built to the dimensions shown - a 610-mm (2-foot) cube, with an access sleeve on or near the top for injecting refrigerant R-1234yf with a gas-tight syringe, an access door on a vertical wall, large enough to insert a calibrated leak standard and with a sealing surface when closed. It shall have a mixing fan (120 V, approximately 40 cfm) installed on the base, and a vacuum motor mount on the top (so with the access door opened, the chamber can be quickly purged of contaminated atmosphere). The slot through which the detector probe passes and sweeps back and forth shall have an overlapping double-strip arrangement of conformable rubber material to seal the chamber around the pass-through of the probe, or the butt joint with face sealing as described in 6.1.1. See illustrations.

The table with the reciprocating platform for the detector testing shall be as described in 6.1.4.

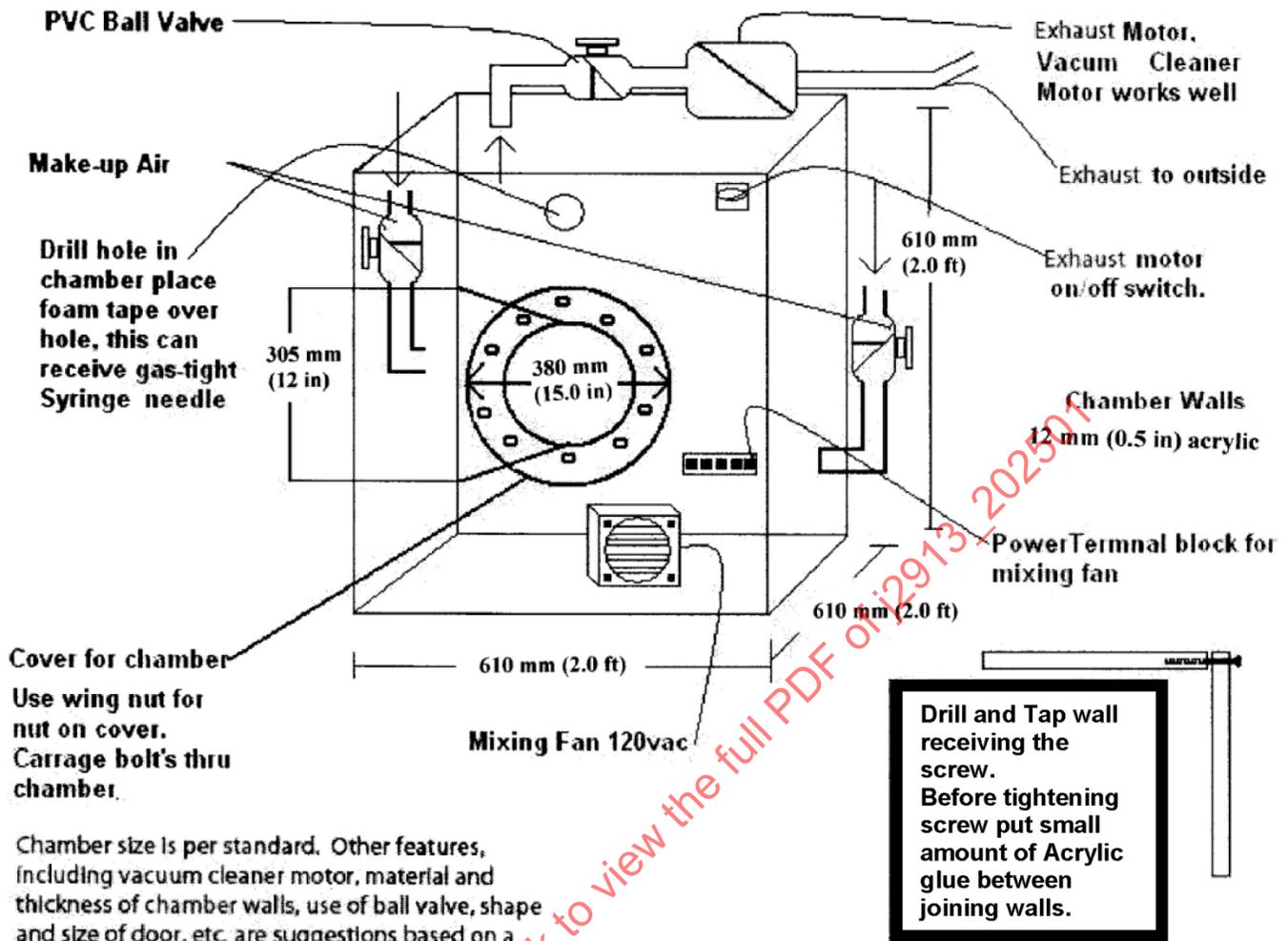
## A.1 HOW TO USE A DETECTOR THAT MEETS THIS STANDARD

The marketer shall provide a prominent warning, accompanying the chart of false triggers, to caution the technician against using cleaning agents or solvents on or near refrigerant lines, and to wipe away both dirt or potential false-triggering chemicals, using a dry shop towel or shop air. The marketer also shall explain that a detector may false-trigger in a contaminated atmosphere, and what steps to take (if any), and/or what time to allow for the detector to clear.

A.1.1 Other instructions that accompany the detector shall include the following:

Leak test with the engine off.

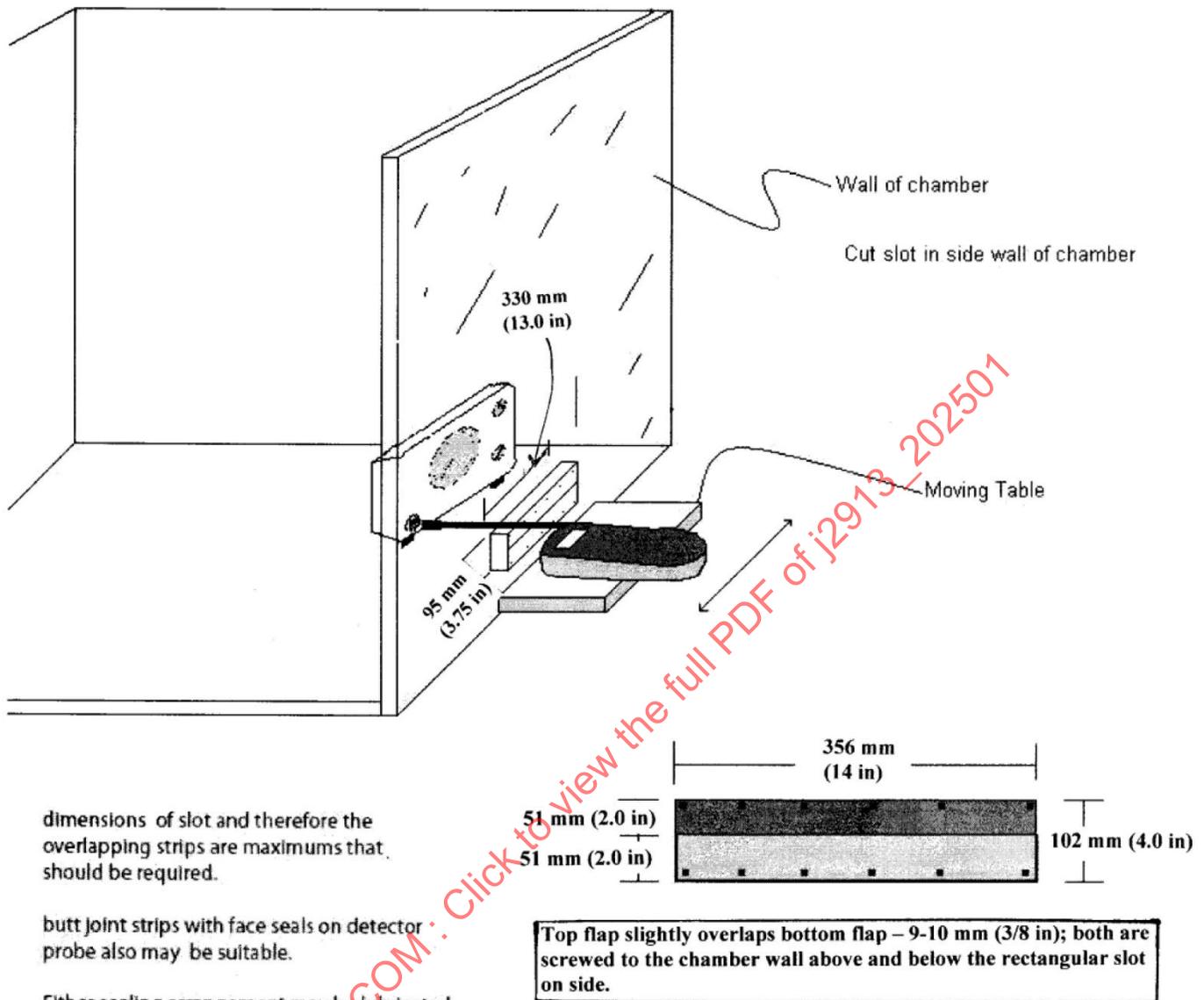
- a. Charge the system with sufficient refrigerant to have a gauge pressure of at least 340 kPa (50 psi) with the system off. At ambient temperatures below 15 °C (59 °F), leaks may not be measurable because the pressure may not be reached.
- b. Visually trace the entire refrigerant system, and look for signs of air conditioning lubricant leakage, damage, and corrosion on all lines, hoses, and components. Check each questionable area with the detector probe, as well as all fittings, hose-to-line couplings, refrigerant controls, service valves with caps in place, brazed or welded areas, and areas around attachment points and hold-downs on lines and components. If looking for an apparently larger leak, check first at the 7 g/yr or 14 g/yr position.
- c. Always follow the refrigerant system around in a continuous path so that no areas of potential leaks are missed. If a leak is found, always continue to test the remainder of the system.
- d. Recheck service valves with caps removed. Blow shop air over service valve to clear immediate area, and then check with detector on 7 g/yr setting.
- e. Move the detector at a rate of no more than 75 mm/s (3 in/s) and as close as possible to 9.5 mm (3/8 inch) from the surface, completely encircling each test position (switch, sensor, refrigerant tubing connection, etc.).
- f. Slower movement and closer approach of the probe normally improves the likelihood of finding a leak. However, detectors made to meet this standard are based on air sampling from the 9.5-mm (3/8-inch) distance. So retest is advisable when a leak appears to be found at the most sensitive settings, particularly if the probe was in a static position on a joint, or making physical contact with a joint, as it was moving. Repeat with a moving probe test at that location, taking care to maintain the small gap (9.5 mm or 3/8 inch) to confirm that the leak is of repairable size. Use of the 7 g/yr (0.25 oz/yr) position of the detector, after finding an apparent leak with the 4 g/yr (0.15 oz/yr) setting, also may be helpful.



Chamber size is per standard. Other features, including vacuum cleaner motor, material and thickness of chamber walls, use of ball valve, shape and size of door, etc. are suggestions based on a sample chamber constructed.

When you evacuate the chamber, be sure exhaust make-up air valves are open. Otherwise, chamber structure might be affected. After evacuating, close all valves.

Figure A1 - Chamber design



dimensions of slot and therefore the overlapping strips are maximums that should be required.

butt joint strips with face seals on detector probe also may be suitable.

Either sealing arrangement may be lubricated to allow smooth movement of detector probe neck.

**Figure A2 - Chamber slot for leak detector probe**