SURFACE VEHICLE STANDARD

J2064™	AUG2015
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Coupled Automotive Refrigerant Air-Conditioning Hose Assemblies

RATIONALE

SAE J3062 has been issued to separate requirements for the hose used in SAE J2064 Coupled Refrigerant Automotive Air-Conditioning Hose Assembly Requirements into its own standard.

Changes made to this document include:

- Title: This will now be a “coupled” hose assembly standard.
- Scope: Changed to reflected “coupled” hose assemblies and removed hose only references. Added the requirement that an SAE J2911 hose must be used in the assembly which meets the requirements of SAE J3062 Automotive Air-Conditioning Hose.
- References: Added SAEJ2911 and SAEJ3062.
- Manufacture: Deleted this section which is related to hose and is now part of SAEJ3062.
- Identification: Changed from “Hose Identification” to “Hose Assembly Identification”. Deleted “Bulk Hose” section and removed hose marking references from “Hose Assembly Identification”.
- Testing: Removed “Age Test”, “Cold Test”, “Vacuum Flattening”, “Length Change”, “Extraction Test”, “Ozone Test” and “Moisture Ingression” tests. Removed listing these test results from Table A1 “Certification Table” shown in Appendix A. These are now requirements of SAEJ3062.

1. SCOPE

The Scope of SAE J2064 covers coupled hose assemblies intended for containing and circulating lubricant, liquid and gaseous R134a and/or R-1234yf refrigerant in automotive air-conditioning systems. Historically, requirements for the hose used in coupled automotive refrigerant air conditioning assemblies was included in SAE J2064. SAE J2064 has been changed to establish the requirements for factory and field coupled hose assemblies. SAE J3062 has been issued to define requirements for the hose used in these assemblies into its own standard. SAE J2064 also provides the necessary values used in SAE J2727 Mobile Air Conditioning System Refrigerant Emission charts for R-134a and R-1234yf. The certified coupling of MAC hose assemblies is required in meeting certain regulatory requirements.

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A hose which has met the requirements of SAE J3062 and certified in J2911 must be used as part of the coupled assembly. A hose which meets the requirements of SAE J3062 does not insure the assembly will meet the requirements of SAE J2064. It is the hose assembly manufacturer's responsibility to confirm that the assemblies meet the specified acceptance criteria for this specification. The hose assembly shall be designed to minimize permeation of the refrigerant, contamination of the system, and to be functional over a temperature range of -30 to 125 °C. Specific construction details are to be agreed upon between user and supplier.

Bulk hose produced prior to the release of this standard could be labeled "SAE J2064" and may not meet the requirements of SAE J3062.

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.

SAE J639 Safety Standards for Motor Vehicle Refrigerant Vapor Compression Systems

SAE J3062 Automotive Air Conditioning Hose

SAE J2911 Procedure for Certification that Requirements for Mobile Air Concitioning System Components, Service Equipment, and Service Technician Training Meet SAE J Standards

SAE J2727 Mobile Air Conditioning System Refrigerant Emission Charts for R-134a and R-1234yf

2.1.2 ASTM Publication

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM D 380 Methods of Testing Rubber Hose

3. HOSE ASSEMBLY IDENTIFICATION

A hose coupling marked or tagged "J2064" signifies that it has been coupled, tested, and has met the requirements of SAE J3062 and SAE J2064 for the marked refrigerant(s). These hose assemblies shall be certified per SAE J2911 for SAE J3062 and SAE J2064. Metal stamping on coupling shall include SAE J2064 and shall be at least 2mm minimum height and must be durable and readable. In lieu of the metal stamping on the coupling, a durable tag must be attached to each hose assembly. The tag shall be metal or mylar with a protective plastic cover. The tag information and must be at least 2mm minimum height, durable and readable and shall include the following information:

- SAE J2064
- (2) Name of hose assembly manufacturer

3.1 Hose Assembly

Hose Assemblies may be fabricated by the manufacturer, an agent for or customer of the manufacturer, or by the user. Fabrication of permanently attached fittings to refrigerant hose requires specialized assembly equipment. Refrigerant hose from one manufacturer may not be compatible with fittings supplied by another manufacturer. Similarly, assembly equipment from one manufacturer may not be interchangeable with that of another manufacturer.

4. TESTING

The test procedures described in the current issue of ASTM D 380 shall be followed whenever applicable.

4.1 Sample Conditioning

Charged Samples shall be stabilized for 24 h at 23 °C ± 2 °C prior to testing. Samples shall be checked to ensure specified charge and identify charge loss.

4.2 Coupled Assembly Permeation Emission Test

4.2.1 Test Specimens - 107 cm Samples

The test specimens are to consist of four coupled hose assemblies that have 107 cm ± 1.2 cm of exposed hose between couplings. Three of the coupled hose assemblies are to be used for determining the permeation rate through the hose at a specific temperature. The fourth coupled and plugged hose assembly is to be used for a control hose.

One end of each hose assembly is to be fitted with a capped charge fitting. The other end is to be attached to a canister (optional) or plugged with a fitting. If a canister is used, the coupled hose assemblies are to be connected to canisters each having an internal volume of 510 cm^3 ± 25 cm^3 and having a minimum burst strength of 8.6 MPa.

4.2.2 Charging Procedure and Initial Weights

The coupled hose assemblies are to be weighed and recorded to 0.01 g to establish an initial weight prior to charging. The test samples (control sample not charged) are to be evacuated then charged with refrigerant to 70% ± 3% of the internal volume of the assembly and then reweighed. Cooling of samples is recommended for ease of charging.

4.2.3 Temperature Exposure

The test temperature is 80 °C ± 2 °C.

4.2.4 Establish Constant Loss Rate

Weigh the samples at the end of the first 24 h temperature exposure and weighing at periodic intervals (minimum period must be 24 h). The weighings shall be reported in net loss of grams, charged sample weight loss minus control sample weight loss. The net weight loss versus time shall continue to be recorded until steady state is reached. Steady state is reached when the last four readings are within 10% of the lowest reading or after 25 days, whichever comes first.

4.2.5 Loss Rate Determination

No charged specimen may lose more than 40 g during the first 24 h period. The permeation rate for each specimen may be determined as follows:

a. For Samples that meet the 10% Rule - Establish the slope of steady-state net loss in grams per day for the 107 cm length specimen and multiply by factors in Table 1 to obtain permeation rate.

b. For Samples that Run for 25 Days - The final weighing period, in which the data recorded will be used to determine the permeation rate, shall be the last 5 days or 7 days of the test period. The samples during the final period shall be weighed 5 times at least 24 h apart. The total net weight loss for the final period, divided by the number of days in the period is multiplied by the factors in Table 1 to obtain the permeation rate.

At the end of the temperature exposure period, the refrigerant charge remaining shall be 50% of the original charge minimum. At the conclusion of the test, the refrigerant charge in each specimen shall be exhausted to a suitable reclamation container.

Table 1 - Conversion factors

Nominal Hose Size mm (in)	Mean Hose ID mm (in)	Multiply g/day by Factor Shown to Obtain kg/m²/year	Multiply g/day to Obtain lb/ft²/ year
8 (5/16)	8.1 (0.320)	13.414	2.748
10 (13/32)	10.6 (0.418)	10.251	2.100
13 (1/2)	13.0 (0.510)	8.358	1.713
16 (5/8)	16.1 (0.635)	6.749	1.383
19 (3/4)	19.4 (0.765)	5.601	1.148

In order to obtain conversion factor for hoses not listed in Table 1, use the following equations:

for kg/m^2/year, Factor = 108.66/D

where:
D = Inner Diameter (mm)

for lb/ft^2/year, Factor = 0.877/D

where:
D = Inner Diameter (inches)

4.2.6 Acceptance Determination

The coupled hose assembly shall not be permeable to a refrigerant loss at a rate greater than those listed in Table 1A below. Hose types are defined in SAE J3062.

Table 1A - Permeation limits

Hose Type	Refrigerant R-134a	R-1234yf
A, B	15 kg/m^2/year	18 kg/m^2/year
C, D, E, F	5 kg/m^2/year	5 kg/m^2/year
C_u, D_u, E_u, F_u	1.5 kg/m^2/year	1.5 kg/m^2/year

$_u$ Designates Ultra Low Permeation Limit

4.3 Coupling Integrity

Coupling Integrity tests the ability of both the hose and the crimped fitting (coupling) to meet the following acceptance criteria. SAE J3062 ensures that the specific manufacturers hose can be successfully coupled to a fitting. It is the hose coupler's responsibility to ensure that the combination of coupling type and specific Hose Manufacturer's Hose Material will meet the following acceptance criteria at all possible combinations of dimensional tolerances.

4.3.1 Test Specimens

Six coupled assemblies shall have 76 mm ± 3 mm of exposed hose and 56 mm ± 8 mm of straight tubing between the couplings with suitable connector and sealed at the other (pinch-welding permitted). Each assembly is attached to a canister with a minimum internal volume of 900 cm^3 and equipped with a charging fitting. The minimum canister volume ensures a maximum pressure loss of 0.10 MPa between recharges. A seventh coupled assembly is used as a volatility sample to account for weight losses not associated with refrigerant losses.

4.3.2 Test Procedure with the Appropriate Refrigerant

4.3.2.1 Charging

Calculate the internal volume of the hose and canister assembly. Charge the canister assembly with an amount of refrigerant compatible lubricant equivalent to half of the internal volume of the hose assembly. Calculate the charge weight of refrigerant by multiplying the system volume less the lubricant volume by using the table below. Evacuate the sample, without removing the lubricant, and add the charge weight ±1 g of refrigerant and record original weight. Check all fittings to ensure against extraneous refrigerant leakage. After charging, agitate the assembly to insure mixing with the lubricant and wetting of all internal surfaces. Hoses need to be dry to obtain accurate weighings. All weighings are to be made at 18 to 29 °C to the nearest 0.01 g.

Table 3 - Charge density

	Temperature [deg C]	Pressure [MPa]	Density [g/cm^3]
R134a	125	2.07	0.0783
HFO1234yf	125	2.07	0.085

Example:

Hose Assembly Volume 19.8 cm^3
Canister Volume 1260 cm^3
Lubricant Volume = (Hose Assembly Volume) / 2
= 9.9 cm^3
Charge Weight = (Canister Volume + Hose Assembly Volume - Lubricant Volume) x 0.0783 g/cm^3
= (1260 cm^3 + 19.8 cm^3 - 9.9 cm^3) x 0.0783 g/cm^3
= 1269.9 cm^3 x 0.0783 g/cm^3
= 99.4 g

4.3.2.2 Test Exposure

The assembly shall be oriented such that the liquid phase will always drain into the test coupling assembly. The test shall include four exposure intervals with Test Option 1 or six exposure intervals with Test Option 2, each followed by a leakage evaluation and possible recharging before the next exposure.

Test Option 1 - The four exposure intervals in sequential order are as follows:

a. Exposure 1 - 96 h at 125 °C ± 2 °C with canister pressure at 2.07 MPa.

b. Exposure 2 - 48 h thermal cycling from -30 to 125 °C in a timer-controlled chamber. The chamber temperature shall change every 4 h and canisters shall reach the desired temperature within 3 h after a temperature change.

c. Exposure 3 - 96 h at 125 °C ± 2 °C with canister pressure at 2.07 MPa.

d. Exposure 4 - 48 h thermal cycling from -30 to 125 °C in a timer-controlled chamber. The chamber temperature shall change every 4 h and canisters shall reach the desired temperature within 3 h after a temperature change.

Test Option 2 - The six exposure intervals in sequential order are as follows:

a. Exposure 1 - 96 h at 121 °C ± 2 °C with canister pressure at 2.0 MPa.

b. Exposure 2 - 48 h at -29 to 121 °C in a timer-controlled chamber. The chamber temperature shall change every 4 h and canisters shall reach the desired temperature within 3 h after a temperature change.

c. Exposure 3 - 96 h at 121 °C ± 2 °C with canister pressure at 2.0 MPa.

d. Exposure 4 - 48 h at -29 to 121 °C in a timer-controlled chamber. The chamber temperature shall change every 4 h and canisters shall reach the desired temperature within 3 h after a temperature change.

e. Exposure 5 - 96 h at 121 °C ± 2 °C with canister pressure at 2.0 MPa.

f. Exposure 6 - 48 h at -29 to 121 °C in a timer-controlled chamber. The chamber temperature shall change every 4 h and canisters shall reach the desired temperature within 3 h after a temperature change.

4.3.2.3 Leakage Evaluation

At the end of each exposure interval, as soon as a canister assembly reaches room temperature of 18 to 29 °C, it shall be evaluated as follows:

a. Examine each sample and note any sign of leakage or abnormalities.

b. Wipe any visible fluid from the hose assembly, then weigh and record the loss in grams for the interval (less the volatility loss).

c. If the net loss is greater than 7 g, terminate the test.

d. Flex test the coupled assembly on the canister to ±15 degrees (±8 degrees for hoses 19 mm ID or greater). Make 10 flex cycles in approximately 10 s in each of two perpendicular planes on a coupling assembly. Immediately evaluate and note the presence of hissing (charge loss) or fluid leakage at each coupling.

e. Wipe any visible fluid from the hose assembly and reweigh. Continue with the next exposure interval if the weight is within 7 g of original weight. If not, recharge to original weight before continuing. Maintaining the weight within 7 g of original weight insures that the canister assembly Refrigerant restarting pressure shall be no less than 2.0 MPa at 125 °C.

4.3.3 Acceptance Determination

a. Applies to six canister assemblies (12 couplings).

b. Maximum net weight loss per canister (2 couplings) per Test Option 1 or Test Option 2 shall not exceed 10 g.

4.4 Assembly Bursting Strength

The minimum bursting strength for hose assemblies shall be 10.6 MPa for discharge and liquid line, 8.3 MPa for suction hose. Test in accordance with ASTM D 380.

4.5 Proof Test

All hose assemblies shall satisfactorily withstand a hydrostatic proof test with a minimum hydrostatic pressure equal to 50% of the minimum required burst strength for a period not less than 30 s or more than 5 min.

4.6 Cleanliness Test

The bore of all hose assemblies shall be clean and dry. When subjected to this test, there shall not be more than 270 mg/m^2 of foreign material. The test hose shall not be less than 300 mm.

4.6.1 Procedure

Bend the hose or hose assembly to a “U” shape, the legs of the “U” being of equal length. Position the hose in a vertical plane and fill the hose to capacity with suitable solvent. Then filter the suitable solvent through a prepared Gooch crucible, sintered glass crucible, or 0.8 µm filter of known weight. After drying at approximately 70 °C for 20 min, determine by weight difference of the insoluble contamination.

5. COMPONENTS FOR R-134A FIELD-COUPLED HOSE ASSEMBLIES

This section applies to hose assemblies when designed for use with only R-134a refrigerant. Insufficient data exist on field coupled R-1234yf refrigerant hose assemblies. When sufficient data becomes available on refrigerant emissions and safety implication of field coupling hose assemblies designed for use with R-1234yf refrigerant, this standard will be updated. Until such time it is not recommended that R-1234yf refrigerant hose assemblies be field coupled. It is the responsibility of the assembly manufacturer ("coupler") to ensure that the assemblies meet the acceptance criteria for this specification. However, it is acceptable for a hose and/or component supplier to accept this responsibility when the following conditions are met.

5.1 Component Validation

For the validation of non-assembled components, the expected variation of the key performance characteristics of the components to be used in a field coupled assembly shall be determined by statistical means. Field coupled assemblies shall be constructed of components that are three standard deviations off of the mean as well as on the mean of the statistical study and selected to provide the minimum, nominal and maximum conditions for evaluation and validation. The variables studied and represented in the validation shall include all variables, which significantly affect the performance of the hose coupling (i.e., crimp diameter, hose O.D., hose I.D., stem O.D., collar wall, etc.).

5.1.1 Validation Tests

All tests within this specification must be conducted in order to validate a design. However, only the following tests are required on the full range of assembly variations:

Burst
Coupling Integrity

5.2 Components Marking

Components to be sold unassembled, but with validation shall be durably marked as follows:

"SAE J2064 – p/n",

where p/n (part number) uniquely identifies both the component manufacturer and component part number.

5.3 Component Manufacturer's Responsibility

The component manufacturer selling a component marked "SAE J2064" shall supply to their customers a spec sheet describing exactly which component goes together with which hose (supplier name, size and part number) and how they should be assembled (including tool part numbers and tolerances) in order to achieve a validated hose coupling.

Upon request, the supplier shall furnish test data supporting section 6.1.

6. NOTES

6.1 Revision Indicator

A change bar (l) 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.