# INTERNATIONAL STANDARD



First edition 2001-09-01

# Rubber and plastics hoses and hose assemblies for automotive air conditioning — Specification —

Part 2: Refrigerant 134a

iTeh STANDARD PREVEW Tuyaux et flexibles en caoutchouc et en plastique pour climatisation des automobiles — Spécifications —

Partie 2: Réfrigérant 134a ISO 8066-2:2001 https://standards.iteh.ai/catalog/standards/sist/e60e49f6-bf63-4c77-b9c9a9547cca458e/iso-8066-2-2001



Reference number ISO 8066-2:2001(E)

#### PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

# iTeh STANDARD PREVIEW (standards.iteh.ai)

<u>ISO 8066-2:2001</u> https://standards.iteh.ai/catalog/standards/sist/e60e49f6-bf63-4c77-b9c9a9547cca458e/iso-8066-2-2001

© ISO 2001

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office Case postale 56 • CH-1211 Geneva 20 Tel. + 41 22 749 01 11 Fax + 41 22 749 09 47 E-mail copyright@iso.ch Web www.iso.ch

Printed in Switzerland

## Contents

Page

Forewo	ord	iv
1	Scope	1
2	Normative references	1
3	Terms and definitions	2
4	Classification	2
5	Dimensions	3
6	Testing and performance requirements	4
7	Marking	8
Annex	A (normative) Determination of refrigerant loss	9
Annex	B (normative) Low-temperature test	12
Annex	C (normative) Determination of amount of matter extracted from hoses by liquid R134a	13
Annex	D (normative) Water ingression test	14
Annex	E (normative) Coupling integrity (sealability). RD PREVIEW	18
Annex	F (informative) ISO and SAE refrigerant hose information	20

<u>ISO 8066-2:2001</u> https://standards.iteh.ai/catalog/standards/sist/e60e49f6-bf63-4c77-b9c9a9547cca458e/iso-8066-2-2001

### Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this part of ISO 8066 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 8066-2 was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 1, *Hoses (rubber and plastics)*.

ISO 8066 consists of the following parts, under the general title Rubber and plastics hoses and hose assemblies for automotive air conditioning — Specification: (standards.iteh.ai)

— Part 1: Refrigerant 12

— Part 2: Refrigerant 134a

ISO 8066-2:2001

https://standards.iteh.ai/catalog/standards/sist/e60e49f6-bf63-4c77-b9c9-

Annexes A, B, C, D and E form a normative part of this part of ISO 8066. Annex F is for information only.

# Rubber and plastics hoses and hose assemblies for automotive air conditioning — Specification —

Part 2: Refrigerant 134a

WARNING — Persons using this part of ISO 8066 should be familiar with normal laboratory practice. This part of ISO 8066 does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user to establish appropriate health and safety practices and to ensure compliance with any national regulatory conditions.

#### 1 Scope

This part of ISO 8066 specifies the requirements for rubber or thermoplastic hoses and hose assemblies used for circulating liquid and gaseous R134a (tetrafluoroethane) in the air-conditioning systems of automobiles. The hoses and hose assemblies are designed in such a way as to restrict losses of refrigerant and contamination of the system. The operational temperature range is -40 °C to +125 °C.

#### (standards.iteh.ai)

Due to the critical relationship between the hose and coupling for this application, a requirement that the coupling to be used in service be used for testing is laid down.

https://standards.iteh.ai/catalog/standards/sist/e60e49f6-bf63-4c77-b9c9a9547cca458e/iso-8066-2-2001

#### 2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 8066. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 8066 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 471:1995, Rubber — Temperatures, humidities and times for conditioning and testing

ISO 1402:1994, Rubber and plastics hoses and hose assemblies — Hydrostatic testing

ISO 1817:1999, Rubber, vulcanized — Determination of the effect of liquids

ISO 3448:1992, Industrial liquid lubricants — ISO viscosity classification

ISO 4671:1999, Rubber and plastics hoses and hose assemblies — Methods of measurement of dimensions

ISO 6803:1994, Rubber or plastics hoses and hose assemblies — Hydraulic-pressure impulse test without flexing

ISO 7326:1991, Rubber and plastics hoses — Assessment of ozone resistance under static conditions

ISO 8330:2001, Rubber and plastics hoses and hose assemblies — Vocabulary

SAE J51:1998, Refrigerant 12 Automotive Air-Conditioning Hose

SAE J2064:1999, R134a Refrigerant Automotive Air-Conditioning Hose

#### 3 Terms and definitions

For the purposes of this part of ISO 8066, the terms and definitions given in ISO 8330 apply.

#### 4 Classification

#### 4.1 Grades

#### 4.1.1 Grades A1 and A2 — Rubber, textile-reinforced

Hoses having a seamless, rubber lining, a reinforcement consisting of textile yarn, cord or fabric bonded to the lining and cover, and an outer cover of heat- and ozone-resistant rubber.

NOTE Commercial products normally offered for grade A1 hoses have a one-braid reinforcement of textile yarn and an outside diameter smaller than that of grade A2 hoses. Grade A2 hoses are a two-braid hose. Hose fittings for grade A1 and A2 hoses are not normally interchangeable.

#### 4.1.2 Grade B — Rubber, wire-reinforced

Hoses having a seamless, rubber lining, a reinforcement consisting of wire, and a cover consisting of a heat-resistant textile yarn impregnated with a rubber cement.

### 4.1.3 Grade C — Thermoplastic-barrier, textile-reinforced, rubber-covered

Hoses having a lining comprising a thermoplastic barrier with a layer of rubber on each side, a reinforcement consisting of textile yarns, and a cover of heat- and ozone-resistant rubber.

#### 4.1.4 Grade D — Thermoplastic-veneer, textile-reinforced, rubber-covered

https://standards.iteh.ai/catalog/standards/sist/e60e49f6-bf63-4c77-b9c9-

Hoses having a rubber lining with a thin thermoplastic veneer on the inside (fluid side), a reinforcement consisting of textile yarn, cord or fabric bonded to the lining and cover, and a cover of heat- and ozone-resistant rubber.

#### 4.1.5 Grade E — Thermoplastic, textile-reinforced, thermoplastic-covered

Hoses having a seamless thermoplastic inner lining, a reinforcement consisting of textile yarn, cord or fabric bonded to the lining and cover, and a cover of heat- and ozone-resistant thermoplastic.

#### 4.2 Groups

#### 4.2.1 Group 1 — Discharge/liquid, moisture-resistant

Hoses for use in discharge/liquid applications that have moisture resistance as defined in 6.15.

#### 4.2.2 Group 2 — Discharge/liquid, medium moisture-resistant

Hoses for use in discharge/liquid applications that have medium moisture resistance as defined in 6.15.

#### 4.2.3 Group 3 — Suction, moisture-resistant

Hoses for use in suction applications that have moisture resistance as defined in 6.15.

#### 4.2.4 Group 4 — Suction, medium moisture-resistant

Hoses for use in suction applications that have medium moisture resistance as defined in 6.15.

#### **Dimensions** 5

#### 5.1 Hose inside and outside diameters

When measured in accordance with method 2 of ISO 4671:1999, the hose inside diameter shall conform to the requirements given in Table 1. When measured in accordance with method 1 of ISO 4671:1999, the hose outside diameter shall conform to the requirements given in Table 2.

	Inside diameter											
Nominal bore	Grade A1		Grade A2		Grade B		Grade C		Grade D		Grade E	
	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
4,8					4,8	5,4					4,6	5,1
6,4	6,2	7,0									6,1	6,7
8	7,8	8,6	7,8	8,6	8,0	8,7	7,8	8,6	8,0	8,7	7,6	8,3
9,5											9,1	9,9
10	10,2	11,1	10,2	11,1	10,3	11,1	10,2	11,1	10,3	11,1	9,9	10,7
13	12,4	13,6	12,4	13,6	12,7	13,7	12,4	13,6	12,7	13,7	12,2	13,2
16	15,6	16,8	15,6	16,8	15,9 A	16,9	15,6	16,8	15,9	16,9	15,2	16,5
22				(sta	na ar	dz3.it	eh.ai		22,2	23,3		
29					28,6	29,8			28,6	29,8		

Table 1	— Inside	diameter
---------	----------	----------

Dimensions in millimetres

https://standards.iteh.ai/catalog/standards/sist/e60e49f6-bf63-4c77-b9c9-

a9547cca458e/iso-8066-2-2001 Table 2 — Outside diameter

**Dimensions in millimetres** 

	Outside diameter											
Nominal bore	Grade A1		Grade A2		Grade B		Grade C		Grade D		Grade E	
	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
4,8					12,7	13,7						8,3
6,4	13,5	15,1										11,4
8	17,5	19,1	18,3	19,8	16,7	17,6	18,3	19,8	16,7	17,6		13,5
9,5												15,2
10	21,4	23,0	22,2	23,8	18,9	20,0	22,2	23,8	18,9	20,0		16,1
13	23,8	25,4	24,6	26,2	22,8	24,0	24,6	26,2	22,8	24,0		18,8
16	27,8	28,5	27,8	29,4	26,8	28,0	27,8	29,4	26,8	28,0		23,4
22					30,6	32,2			30,6	32,2		
29					37,3	38,9			37,3	38,9		

#### 5.2 Hose wall thickness variation

When the wall thickness is measured in accordance with method 2 of ISO 4671:1999, the variation in the wall thickness shall not exceed the values given in Table 3.

Gra	des A, B, C and D	Grade E		
Nominal bore Maximum departure from concentricity		Nominal bore	Maximum departure from concentricity	
	mm		mm	
4,8 and 6,4	0,8	4,8 and 6,4	0,5	
8 to 22	1,0	8 to 13	0,6	
29	1,3	16	0,8	

Table 3 —	Wall thickness	variation
-----------	----------------	-----------

#### 6 Testing and performance requirements

#### 6.1 Test conditions and test fluid

The testing room shall be kept at standard temperature in accordance with ISO 471. The temperature of the hoses or hose assemblies shall be stabilized for 24 h before testing.

### standards.iteh.ai)

Except for the extraction test in 6.10 which uses refrigerant R134a only, the refrigerant used shall be R134a containing (10 ± 1) % of poly(alkylene glycol) (PAG) lubricating oil when required. The hose shall be tested with the same couplings as those intended for end use. The end termination of the coupling may be of a convenient type for testing.

#### 6.2 Leakage

#### 6.2.1 Requirement

When determined in accordance with the procedure given in 6.2.2, the loss in mass of refrigerant shall be no greater than 10 % of the initial mass of the refrigerant and there shall be no visible deterioration in the hoses or hose assemblies.

#### 6.2.2 Procedure

Test three test pieces. Fill each test piece with R134a containing  $(10 \pm 1)$  % PAG oil. Maintain each test piece for 24 h at a temperature of 90 °C ± 2 °C.

NOTE This test may be carried out separately or during the 24 h pre-conditioning period for the refrigerant loss test (see 6.3) at 90 °C  $\pm$  2 °C.

In the event that the test is carried out separately from 6.3, use the procedure described in annex A.

#### 6.3 Refrigerant loss

#### 6.3.1 Requirement

When determined in accordance with the procedure described in 6.3.2, the loss of refrigerant from the hoses or hose assemblies shall be no greater than the values given in Table 4.

#### 6.3.2 Procedure

Test the hoses or hose assemblies in accordance with the procedure described in annex A at the temperature specified in Table 4. Test hoses or hose assemblies used in the part of the system operating at high pressure at 90 °C  $\pm$  2 °C. Test hoses or hose assemblies used in the part of the system operating at low pressure (suction line applications) at 80 °C  $\pm$  2 °C.

Test temperature	Maximum allowable loss of refrigerant <sup>a</sup> kg/m²/year					
C	Grades A and B	Grades C, D and E				
80	29,0	9,7				
90	40,0	30,0				
<sup>a</sup> Based on the internal surface area of the hose.						

#### Table 4 — Refrigerant loss

#### 6.4 Ageing

#### 6.4.1 Requirement

When tested in accordance with 6.4.2, there shall be no leak or loss during the test from cracks in a test hose or hose assembly.

# (standards.iteh.ai)

#### 6.4.2 Procedure

#### ISO 8066-2:2001

Wind a hose or hose assembly, of length between 300 mm and 1,000 mm, on to a mandrel having a diameter eight times the outside diameter of the hose. Place the mandrel and hose or hose assembly in a circulating-air oven for 168 h at 125 °C  $\pm$  2 °C.

Take the mandrel and hose or hose assembly out of the oven, allow to cool to ambient temperature, unwind the hose or hose assembly and examine it externally for any cracks, disintegration or other defects. Subject the hose or hose assembly to an internal hydrostatic pressure of 2,4 MPa (24 bar) for 5 min to show any leak or loss of liquid.

#### 6.5 Low-temperature test

When tested in accordance with the method described in annex B, there shall be no leak or loss due to cracks or splits.

#### 6.6 Reduced pressure

#### 6.6.1 General

A hose or hose assembly shall be subjected, consecutively, to the reduced-pressure test, then the length variation test (6.7), then the burst test (6.8).

#### 6.6.2 Requirement

The decrease in the outside diameter of the hose shall not exceed 20 % of the initial outside diameter when the hose or hose assembly is subjected to a reduced internal pressure (vacuum) of 13,3 kPa  $\pm$  6 kPa (absolute) for 2 min in accordance with 6.6.3.

#### 6.6.3 Procedure

The test hose or hose assembly shall have a free length of from 610 mm to 1000 mm. Bend the hose into a U-shape, whereby the internal radius of the base of the U shall be five times the mean outside diameter of the hose. Apply a vacuum of 13,3 kPa  $\pm$  kPa (absolute) to the bent hose for 2 min. At the end of this period and while the vacuum is still being applied, measure the outside diameter of the hose at the base of the U, in order to determine the minimum outside diameter at that point.

#### 6.7 Length change under pressure (see 6.6)

#### 6.7.1 Requirement

When subjected to a pressure of 2,4 MPa (24 bar), a hose or hose assembly shall not contract by more than 4 % or extend by more than 2 %.

#### 6.7.2 Procedure

Subject the hose or hose assembly, in a horizontal position, to an internal hydrostatic pressure of 7 kPa (0,07 bar) and measure the length. Increase the pressure to the prescribed value and measure the length once again within the following minute. Express the length as a percentage of the length at 7 kPa (0,07 bar).

Refer to ISO 1402 for additional information.

# 6.8 Minimum bursting pressure (see 6.6)

When determined in accordance with the method described in ISO 1402, using test pieces that have been subjected to the test for refrigerant loss described in 6.3, the minimum bursting pressure shall be 12 MPa (120 bar) for all grades and sizes of hose and hose assembly.

6.9 Proof pressure https://standards.iteh.ai/catalog/standards/sist/e60e49f6-bf63-4c77-b9c9a9547cca458e/iso-8066-2-2001

#### 6.9.1 Requirement

When tested in accordance with the procedure described in 6.9.2, a hose or hose assembly shall exhibit no leakage, cracking, abrupt distortion (indicating irregularity in materials or manufacture) or other signs of failure.

#### 6.9.2 Procedure

Hydrostatically pressurize a hose or hose assembly to 50 % of the minimum burst pressure and hold the pressure for 2 min  $\pm$  30 s. During and after the proof pressure hold period, examine the hose.

#### 6.10 Extraction by R134a

When determined in accordance with annex C, the quantity of matter extracted from the lining of the hose by the R134a shall not exceed 118 g/m<sup>2</sup>.

NOTE The substances extracted will be of an oily or greasy nature.

#### 6.11 Volume change in R134a

#### 6.11.1 General

This requirement applies only to the lining of the hose and is carried out by the method described in ISO 1817.

Place a test portion of the lining in a pressure vessel, cooled to below -30 °C and totally immersed in R134a containing (10 ± 1) % PAG oil. Seal the vessel and place it in a circulating-air oven at 90 °C ± 2 °C.

#### 6.11.2 Rubber materials

When the test is carried out in accordance with ISO 1817 for 70 h at 90 °C  $\pm$  2 °C in R134a containing (10  $\pm$  1) % PAG oil, the volume change measured during the 5 min after taking the test portion out of the refrigerant shall be between – 5 % and + 35 %.

#### 6.11.3 Thermoplastic materials

When the test is carried out in accordance with ISO 1817 for 70 h at 90 °C  $\pm$  2 °C in R134a containing (10  $\pm$  1) % PAG oil, the volume change measured during the 5 min after taking the test portion out of the refrigerant shall be within  $\pm$ 5 %.

#### 6.12 Ozone resistance

This requirement applies only to grade A, C, D and E hoses.

Bend the hose around a mandrel with a diameter equal to eight times the mean outside diameter of the hose, and carry out the test in accordance with method 1 of ISO 7326:1991 using an ozone concentration of 50 mPa  $\pm$  5 mPa.

The hose cover shall exhibit no visible cracks when viewed under ×2 magnification.

#### 6.13 Hose cleanliness

# 6.13.1 Requirement iTeh STANDARD PREVIEW

The tube of the hose shall be dry and clean. When determined in accordance with 6.13.2, the mass of insoluble matter shall be a maximum of 270 mg/m<sup>2</sup> based on the internal surface area of the hose.

#### 6.13.2 Procedure

#### ISO 8066-2:2001

https://standards.iteh.ai/catalog/standards/sist/e60e49f6-bf63-4c77-b9c9-

Take a hose test piece having a minimum length of 300 mm. Bend the hose into a U-shape, with the legs of the U of equal length. Place the hose in a vertical position and fill the hose with a solvent suitable as a substitute for trichlorotrifluorethane (CFC113).

The following solvents can be used as substitutes for trichlorotrifluorethane (this is only a partial list of acceptable substitutes, and other materials may be more readily available):

- *N*-propyl bromide, which is manufactured by Amity under the trade name Leksol;
- hydrofluoroether, which is manufactured by 3M under the trade name HFE 7100;
- decafluoropentane/dichloroethylene blend, which is manufactured by DuPont under the trade name Vertrel MCA.

NOTE Trichlorotrifluorethane used to be the recommended solvent for this test, but it is not available for most applications and in many locations since it has been identified as an ozone-depleting chemical.

Immediately empty the hose, filtering the solvent through a prepared Gooch crucible, a sintered-glass crucible or a  $0.4 \,\mu m$  filter of known mass.

After drying the filter and residue at approximately 70 °C for 20 min, determine the mass of insoluble matter by difference.