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

Part 3: Refrigerant 1234yf

Tuyaux et flexibles en caoutchouc et en plastique pour climatisation des automobiles — Spécifications —
Partie 3: Réfrigérant 1234yf

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 1, *Rubber and plastics hoses and hose assemblies*.

A list of all parts in the ISO 8066 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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

Part 3:
Refrigerant 1234yf

WARNING — Persons using this document should be familiar with normal laboratory practice. This document 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 document specifies the requirements for rubber or thermoplastic hoses and hose assemblies used for circulating liquid and gaseous R1234yf (tetrafluoropropene) 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.

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 has been laid down.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

ISO 4671:2007, *Rubber and plastics hoses and hose assemblies — Methods of measurement of the dimensions of hoses and the lengths of hose assemblies*

ISO 7326:2016, *Rubber and plastics hoses — Assessment of ozone resistance under static conditions*

ISO 8330, *Rubber and plastics hoses and hose assemblies — Vocabulary*

ISO 23529, *Rubber — General procedures for preparing and conditioning test pieces for physical test methods*

ISO/TR 11340, *Rubber and rubber products — Hydraulic hose assemblies — External leakage classification for hydraulic systems*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at https://www.iso.org/obp

4 Classification

4.1 Types

4.1.1 General

Including, but not limited to the following.

4.1.2 Type A — Rubber, textile-reinforced, rubber-covered

The hose shall be built having a suitable seamless synthetic rubber tube. The reinforcement shall consist of textile yarn, cord, or fabric adhered to the tube and cover. The outer cover shall be heat- and ozone-resistant synthetic rubber.

4.1.3 Type B — Rubber, wire-reinforced, rubber-covered

The hose shall be built having a suitable seamless synthetic rubber tube. The reinforcement shall consist of steel wire adhered to the rubber tube. The cover shall consist of a heat-resistant textile yarn impregnated with a synthetic rubber cement.

4.1.4 Type C — Barrier, textile-reinforced, rubber-covered

The hose shall have a suitable thermoplastic barrier between rubber layers. The reinforcement shall consist of suitable textile yarn, cord, or fabric adhered to the tube and cover. The outer cover shall be heat- and ozone-resistant synthetic rubber.

4.1.5 Type D — Thermoplastic, textile-reinforced, thermoplastic-covered

The hose shall have a suitable thermoplastic tube. The reinforcement shall consist of a suitable textile yarn, cord, or fabric adhered to the tube and cover. The outer cover shall be heat- and ozone-resistant synthetic elastomer.

4.1.6 Type E — Veneer, textile-reinforced, rubber-covered

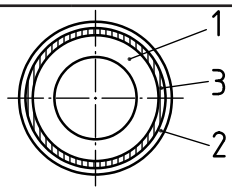
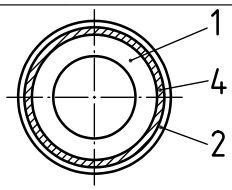
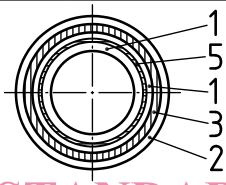
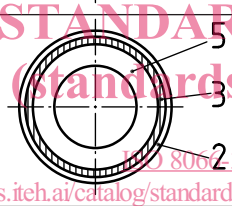
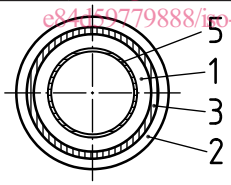
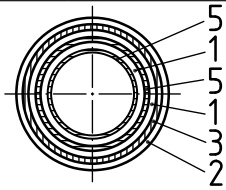
The hose shall have a suitable thermoplastic veneer lining with a rubber tube outer layer. The reinforcement shall consist of a textile yarn, cord, or fabric adhered to the tube and cover. The cover shall be heat- and ozone-resistant synthetic rubber.

4.1.7 Type F — Veneer, barrier, thermoplastic liner

The hose shall have a suitable thermoplastic veneer liner with a thermoplastic barrier between elastomeric layers. The reinforcement shall consist of a suitable textile yarn, cord, or fabric adhered to the tube and cover. The cover shall be heat- and ozone-resistant elastomer.

Table 1 gives the figure and applicable pressure class for each type.

Table 1 — Figure and applicable pressure class

Type	Figure	Applicable pressure class	
		High	Low
A		X	X
B		X	N/A
C		X	X
D		X	N/A
E		X	X
F		X	X

Key

1 rubber
2 cover
3 textile
4 wire
5 thermoplastic resin

X = Applicable
N/A = Not applicable

4.2 Pressure classes

4.2.1 High — Discharge and liquid applications.

4.2.2 Low — Suction application.

Working pressures are given in Table 2.

Table 2 — Working pressure

Pressure class	Working pressure MPa (bar)
High	3,28 (32,8)
Low	1,06 (10,6)

4.3 Moisture-ingression grades

4.3.1 ML — Low moisture ingression hose as defined in 6.14.

4.3.2 Mm — Medium moisture ingression hose as defined in 6.14.

4.4 Refrigerant-permeation grades

4.4.1 RU — Ultra low refrigerant permeation hose as defined in 6.3.2.

4.4.2 RL — Low refrigerant permeation hose as defined in 6.3.2.

4.4.3 Rm — Medium refrigerant permeation hose as defined in 6.3.2.

5 Dimensions

5.1 Hose inside diameters

Standard dimensions are given in Table 3, but not limited to the following.

Table 3 — Typical inside diameters

Nominal size	Mean inside diameter mm
8 (5/16)	8
10 (13/32)	10,3
11	11
13 (1/2)	12,7
14	14
15	15
16 (5/8)	15,9
19 (3/4)	19
25 (1)	25,4
NOTE Nominal size in parenthesis is in inches.	

5.2 Hose wall thickness variation

When the wall thickness is measured in accordance with method 2 of ISO 4671:2007, the variation in the wall thickness shall not exceed the values given in Table 4.

Table 4 — Wall thickness variation

Type A, B, C and E		Type D and F	
Nominal size	**Maximum departure from concentricity** mm	**Nominal size**	**Maximum departure from concentricity** mm
Up to and including 19	1,0	Up to and including 13	0,6
		Over 13 and including 19	0,8
Over 19	1,3	Over 19	1,0

6 Testing and performance requirements

6.1 Test conditions

The testing room shall be kept at standard temperature in accordance with ISO 23529. The temperature of the hoses or hose assemblies shall be stabilized for 24 h before testing.

6.2 Leakage

6.2.1 Method A for type test and production test

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 for method A

Test three test pieces. Fill each test piece with R1234yf containing (10 ± 1) % refrigerant compatible lubrication oil. Maintain each test piece with the pressure listed in Table 2 for 24 h at a temperature of 80 °C ± 2 °C.

This test can be carried out separately or during the 24 h pre-conditioning period for the refrigerant loss test (see 6.3) at 80 °C ± 2 °C. When the test is carried out separately from 6.3, use the procedure described in Annex A.

6.2.3 Method B for routine test

When determined in accordance with the procedure given in 6.2.4, there shall be no leak and no visible deterioration in the hoses or hose assemblies. When pricked hose is tested, gas bubbles which form on the surface of the hose and decrease gradually after pressurizing may be observed but not be considered as a leak.

6.2.4 Procedure for method B

Immerse the test assembly in the water bath. Apply gas (air or inert gases) pressure and maintain the pressure listed in Table 2 for 5 min. Also, a gas leak detector, snoop liquid leak detector may be applied to check leakage under the pressure listed in Table 2 for 5 min.

6.3 Refrigerant permeation

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 5.

6.3.2 Procedure

Test the hoses or hose assemblies in accordance with the procedure described in Annex A at 80 °C ± 2 °C.

Table 5 — Refrigerant permeation

Refrigerant-permeation grade	Maximum allowable loss of refrigerant kg/m^2/year
RU	1,5
RL	5
Rm	18

6.4 Ageing

6.4.1 Requirement

When tested in accordance with 6.4.2, there shall be no leak and no cracks in a test hose or hose assembly.

6.4.2 Procedure

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 ± 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. Then test the hose or hose assembly in accordance with the procedure given in 6.2.3 and 6.2.4.

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 Vacuum resistance

6.6.1 General

A hose or hose assembly shall be subjected, consecutively, to the vacuum 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 and there shall be no obstruction of flow caused by the hose collapse when the hose or hose assembly is subjected to a reduced internal pressure (vacuum) of 1,33 kPa ± 0,66 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 1 000 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. Measure the minor axis, d_1, at the base of the U. Apply a vacuum of 1,33 kPa ± 0,66 kPa (absolute) to the bent hose for 2 min. At the end of this period and while the vacuum is still being