غرفـــة صناعـــة الأردن
Jordan Chamber of Industry

Ref. No. الرقم

Date التاريخ

السادة قطاع الصناعات البلاستيكية والمطاطية المحترمين

الموضوع: تعميم مواصفة

تحية طيبة وبعد،

ارفـق لحضـراتكم كتـاب عطوفـة مـدير عـام مؤسسـة المواصـفات والمقـاييس رقـم م/عـام/12828 تـاريخ 2023/08/02 والمتضـمن التصـويت علـى مشـروع المواصـفة القياسـية الأردنيـة 502-2023/1 الخاصـة بـالخراطيم والأنابيب المطاطيـة والبلاستيكية وتركيباتها للاستخدام مـع البروبـان والبيوتـان ومخاليطهمـا فـي حالـة البخار، الجزء 1: الخراطيم والأنابيب، والذي اعدته اللجنة الفنية الدائمة للدائن رقم (22).

أرجو العلم والاطـلاع والمشاركة الفاعلـة فـي ابداء الملاحظـات الفنيـة علـى المشروع أعـلاه وذلك بواسطة بطاقـة التصويت المرفقة وارسالها إلى غرفة صناعة الأردن على فاكس رقم 4643719 06 أو على البريد الالكتروني info@jci.org.jo **في موعد أقصاه 2023/09/24.**

وتفضلوا حضراتكم بقبول فائق الاحترام والتقدير،

م. علاء أبو خزنة
عضو مجلس إدارة غرفة صناعة الأردن
ممثل قطاع الصناعات البلاستيكية والمطاطية

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مؤسسة المواصفات والمقاييس الأردنية

الرقم: م/عام/12828
التاريخ: 15/01/1445هـ
الموافق: 02/08/2023م

معالي .....
عطوفة .....
سعادة .....

تحية طيبة وبعد،

أرجو معاليكم/عطوفتكم/سعادتكم التكرم بالعلم بأن أسلوب العمل الفني المتبع في وضع المواصفات القياسية والقواعد الفنية الأردنية يقتضي تعميم مشروع التصويت على الجهات ذات العلاقة، وذلك لإبداء الرأي والتصويت عليه تمهيداً لعرضه على مجلس الإدارة لاعتماده كمواصفة قياسية أو قاعدة فنية أردنية.

لذا أرجو أن أرفق لكم طياً نسخة عن مشروع التصويت للمواصفة القياسية الأردنية ٥٠٢-١/٢٠٢٣ الخاصة بالخراطيم والأنابيب المطاطية والبلاستيكية وتركيباتها للاستخدام مع البروبان والبيوتان ومخاليطهما في حالة البخار، الجزء ١: الخراطيم والأنابيب، الذي أعدته اللجنة الفنية الدائمة للدائن رقم (٢٢).

يرجى التكرم بعرض هذا المشروع على المختصين لديكم وموافاتنا بردكم عليه خلال شهرين من تاريخه، وذلك باستخدام بطاقة التصويت المرفقة، علماً بأن عدم الرد خلال المدة يعتبر موافقة من قبلكم على المشروع المذكور.

وتفضلوا بقبول فائق الاحترام

المديـــر العـــام

م. عبير بركات الزهير

05 AUG 2023
رقم التسجيل ١١٥١/١/٨/١٩

المرفقات:
- مشروع التصويت
- بطاقة التصويت

نسخة/ مدير مديرية التقييس
نسخة/ رئيس قسم فحص ومتابعة المواصفات
نسخة/ رئيس قسم الصناعات الكيميائية
نسخة/ م. كفاح صالح
مدير – ٢٠٢٣/٧/٢٦

مؤسسة المواصفات والمقاييس الأردنية

الرقم: م./عام/12828

التاريخ: 15/01/1445هـ

الموافق: 02/08/2023م

تعميم مشروع التصويت

عنوان المشروع: الخراطيم والأنابيب المطاطية والبلاستيكية وتركيباتها للاستخدام مع البروبان والبيوتان ومخاليطهما في حالة البخار.

الجزء ١: الخراطيم والأنابيب

سكرتير اللجنة الفنية: م. كفاح صالح

الرقم	الجهة	الرقم	الجهة
١	وزارة البيئة	١٠	الجمعية العلمية الملكية
٢	وزارة الصحة/ مديرية صحة البيئة	١١	الجمعية الكيميائية الأردنية
٣	وزارة الصناعة والتجارة والتموين	١٢	الجمعية الوطنية لحماية المستهلك
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٦	أمانة عمان الكبرى	١٥	غرفة صناعة عمان
٧	مؤسسة التدريب المهني	١٦	غرفة تجارة عمان
٨	الجامعة الأردنية	١٧	القيادة العامة للقوات المسلحة الأردنية- الجيش العربي/ المختبرات العسكرية لمراقبة الجودة
٩	نقابة المهندسين الأردنيين		

المدير العام

م. عبير بركات الزهير

نسخة/ مدير مديرية التقييس

نسخة/ رئيس قسم فحص ومتابعة الواصفات

نسخة/ رئيس قسم الصناعات الكيميائية

نسخة/ م. كفاح صالح

غدير – ٢٠٢٣/٧/٢٦

مؤسسة المواصفات والمقاييس الأردنية

بطاقة تصويت

رقم المشروع: ٥٠٢-١/٢٠٢٣	عنوان المشروع: الخراطيم والأنابيب المطاطية والبلاستيكية وتركيباتها للاستخدام مع البروبان والبيوتان ومخاليطهما في حالة البخار. الجزء ١: الخراطيم والأنابيب
اسم اللجنة الفنية: اللدائن (٢٢)	سكرتير اللجنة الفنية: م. كفاح صالح
تاريخ التعميم: ٢٠٢٣/٠٧/٢٦	آخر موعد للرد: ٣٠٢٣/٠٩/٢٦

الرقم	نوع الملاحظة			الملاحظة *	التعديل المقترح	رأي اللجنة الفنية
	عامة	فنية	هيكلية وصياغية			

النتيجة النهائية للتصويت:

☐ موافقة (لا توجد ملاحظات).

☐ موافقة مع الملاحظات المرفقة ، والتي يمكن الأخذ بها أو تجاوزها حسب الاقتضاء.

☐ عدم موافقة للأسباب الفنية المرفقة، والتي عند زوالها ينقلب التصويت إلى موافقة.

* يرجى تزويدنا بالمراجع التي اعتمد عليها في حالة وجود ملاحظات.

الجهة القائمة بالتصويت:	التاريخ:
اسم الشخص المسؤول:	

DJS 502-1:2023
Third edition

ع ت ٥٠٢-١/٢٠٢٣
الإصدار الثالث

مشروع مبدئي
(تبنّ معدل)

الخراطيم والأنابيب المطاطية والبلاستيكية وتركيباتها للاستخدام مع البروبان والبيوتان ومخاليطهما في حالة البخار
الجزء ١: الخراطيم والأنابيب

Rubber and plastics hoses, tubing and assemblies for use with propane and butane and their mixtures in the vapour phase
Part 1: Hoses and tubings

مؤسسة المواصفات والمقاييس
المملكة الأردنية الهاشمية

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This Jordanian Standard cancels and replaces the same standard Jordanian 502 issued in 2005.

Foreword

The Jordan Institution for Standards and Metrology is the national standardization body in Jordan. The work of preparing Jordanian Standards is normally carried out by technical committees composed of the interested parties, which are involved in the scope of standard. All the interested parties have the right to vote on the draft Jordanian Standard during the enquiry stage, taking into consideration the importance of harmonizing Jordanian Standards with the International, regional or national standards (as much as possible) for the purpose of eliminating technical barriers to trade and facilitating the International trade.

Jordanian Standards are drafted in accordance with the rules given in the Jordanian Directive 1-2:2005, part 2: Rules for the structure and drafting of Jordanian Standards*.

The permanent technical committee for Plastics 22 has studied the Jordanian Standard 502:2005 BS 3212:1991 related to **"Hoses – Specifications and test methods for flexible rubber tubing, rubber hose and rubber hose assemblies for use in LPG vapor phase and LPG/air installations"**, and the prepared project 502-1:2023 related to **"Rubber and plastics hoses, tubing and assemblies for use with propane and butane and their mixtures in the vapour phase, Part 1: Hoses and tubings"** and has recommended to approve the amended project as a Jordanian Standard 502-1:2023, according to article (12) of Standards and Metrology Law No. (22) for the year 2000 and it's amendments.

This Jordanian Standard includes the following parts under the same general title, **"Rubber and plastics hoses, tubing and assemblies for use with propane and butane and their mixtures in the vapour phase"**:
– Part 1: Hoses and tubings.
– Part 2: Assemblies.

This Jordanian Standard 502:2023 is an modified adoption of the European Standard 16436-1:2014+A3:2020 **"Rubber and plastics hoses, tubing and assemblies for use with propane and butane and their mixtures in the vapour phase, Part 1: Hoses and tubings"** using reprint method, single vertical bars (|) in the margins are used to indicate the applicable technical modifications which have been changed and shown in annex NA, and single vertical dotted bars (⋮) in the margins are used to indicate the applicable editorial modifications which have been changed and listed below.

For the purposes of this Jordanian Standard, the following editorial changes have been made:
– Substitution of "this European Standard ", "this document" by "this Jordanian Standard".
– Add the world "clause" before any referenced clause number.
– Arrange normative references in ascending order.
– Adding of "or to another technically equivalent standard" to clauses 9 b).
– Delete Annex B, because it is related to Italy regulations.
– Inclusion of bibliography in an informative Annex B.

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* under amendment.

Rubber and plastics hoses, tubing and assemblies for use with propane and butane and their mixtures in the vapour phase
Part 1: Hoses and tubings

1- Scope

This Jordanian Standards specifies the characteristics and performance requirements for tubing and hoses made of either rubber or plastics for use with commercial propane and commercial butane and mixtures thereof, in the vapour phase, for connection of appliances, from:
- pressurized gas container to a regulating device,
- pressurized gas container to an appliance,
- regulating device to an appliance, and
- regulating device to installation pipework,

in environments of a temperature range from –30 °C to +70 °C. Working pressures are from 0 bar to 30 bar.
Three classes are defined in Table 1 according to the maximum working pressures and minimum ambient temperatures.
This Jordanian Standards only covers the tubing or hose part of assemblies. The assemblies themselves will be covered by EN 16436-2.
This Jordanian Standards does not apply to hoses for:
- welding purposes (see EN ISO 3821, EN 1327);
- propulsion purposes;
- LPG transfer purposes (see EN 1762).

2- Normative references

The following referenced documents are indispensable for the application 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 37, Rubber, vulcanized or thermoplastic – Determination of tensile stress-strain properties.
- ISO 105-A02, Textiles – Tests for colour fastness – Part A02: Grey scale for assessing change in colour.
- ISO 188, Rubber, vulcanized or thermoplastic – Accelerated ageing and heat resistance tests.
- EN ISO 176, Plastics – Determination of loss of plasticizers – Activated carbon method (ISO 176:2005).
- EN ISO 1402, Rubber and plastics hoses and hose assemblies – Hydrostatic testing (ISO 1402:2009).
- EN ISO 4080, Rubber and plastics hoses and hose assemblies – Determination of permeability to gas (ISO 4080:2009).
- EN ISO 4671, Rubber and plastics hoses and hose assemblies – Methods of measurement of the dimensions of hoses and the lengths of hose assemblies (ISO 4671:2007).
- EN ISO 7326, Rubber and plastics hoses – Assessment of ozone resistance under static conditions (ISO 7326:2016).
- EN ISO 8033, Rubber and plastics hoses – Determination of adhesion between components (ISO 8033:2016).
- EN ISO 8330:2008, Rubber and plastics hoses and hose assemblies – Vocabulary (ISO 8330:2007).
- EN ISO 10619-2, Rubber and plastics hoses and tubing – Measurement of flexibility and stiffness, Part 2: Bending tests at sub-ambient temperatures (ISO 10619-2:2017).
- EN ISO 30013, Rubber and plastics hoses – Methods of exposure to laboratory light sources – Determination of changes in colour, appearance and other physical properties (ISO 30013:2011).

3- Terms and definitions

For the purposes of this Jordanian Standard, the following terms and definitions given in EN ISO 8330:2008 and the following apply:

3-1

commercial butane

hydrocarbon product composed predominantly of butanes and/or butenes

Note: The remaining part can consist mainly of propane/propene and pentane/pentene isomers.

[Source: ISO 9162].

3-2

commercial propane

hydrocarbon product composed predominantly of propane and/or propene

Note: The remaining part can consist mainly of ethane/ethene and butane/butene isomers.

[Source: ISO 9162].

3-3

tubing

single core of plastic or rubber with no reinforcement or cover

3-4

hose

rubber or flexible thermoplastic lining with a reinforcement made of natural or synthetic textile material applied either spirally wound or braided, and a flexible rubber or thermoplastic outer cover

4- Classification of tubing and hose

One class of tubing and two classes of hose are specified in Table 1 depending on the maximum working pressure and minimal ambient temperatures.

Table 1 – Classification of tubings and hoses

Class	Maximum working pressure bar	Minimum ambient temperature °C
1 (tubing)	0,2	-20
2 (hose)	10	-30
3 (hose)	30	

Note: Classes 1 and 2 are usually used downstream of a pressure regulating device.

5- Materials and construction of tubing and hoses

Class 1 tubing shall be made of rubber or thermoplastic material.

Class 2 and class 3 hoses shall comprise a:

- rubber or thermoplastics lining;
- reinforcement of natural or synthetic fibres applied either spirally wound or braided;
- rubber or plastics cover. The outer cover may be pricked to allow any gas trapped between the inner lining and outer cover to be released.

The surface colour of the tubing or hose shall be:

- orange (see Figure 1a); or
- black with the marking above, on, or below a continuous orange line of 5 mm minimum width (see Figure 1b); or
- white for classes 1 and 2 with the marking above, on, or below a continuous orange line of 5 mm minimum width (see Figure 2).

a) option 1

b) option 2

Key

orange colour
black colour

Figure 1 – Possible marking for classes 1, 2 or 3

Key

orange colour
white colour

Figure 2 – Possible marking for classes 1 or 2

6- Dimensions of tubing and hoses

6-1 Inside diameters, wall thicknesses and concentricity

When measured in accordance with EN ISO 4671 the inside diameters, tolerances and concentricity shall conform to the values given in Table 2.

Table 2 – Dimensions of hoses or tubing

Dimensions in millimetres

Inside diameters	3,2	4,0	5,0	6,3	8,0	9,0	10,0	10,5	12,5	14,0
Tolerance of inside diameter	± 0,3	± 0,4	± 0,4	± 0,5	± 0,5	± 0,5	± 0,6	± 0,6	± 0,6	± 1,0
Maximum variation in concentricity	0,3	0,4	0,4	0,4	0,5	0,5	0,5	0,5	0,5	0,6
Wall thickness class 1 and class 2	2,5	3,5	3,5	3,5	3,5	3,5	5,0	5,0	5,0	5,0
Wall thickness class 3	3,5	4,0	4,0	5,0	5,0	5,0	5,0	5,0	6,0	6,0
Tolerance of wall thickness	± 0,4	± 0,4	± 0,4	± 0,4	± 0,5	± 0,5	± 0,5	± 0,5	± 0,5	± 0,5

6-2 Measurement of ovality

When measuring on a hose cross section, the minimum diameter D_{min} and the maximum diameter D_{max}, the ratio D_{min}/D_{max} shall not be less than 0,80.

7- Properties of materials for tubing, lining and cover of hoses

7-1 Tensile strength and elongation at break

When tested in accordance with clause A-2, the materials used for tubing, lining and cover of hoses shall conform to the values given in Table 3.

Table 3 – Requirements for tensile strength and elongation at break

Class	Component	Tensile strength min. MPa	Elongation at break min. %
1	Tubing	7,0	250
2, 3	Lining and cover		

7-2 Accelerated ageing

After ageing in accordance with ISO 188, using a normal air oven and conditions given in Table 4, materials used for tubing, for the lining and cover of hoses shall conform to the values given in Table 4.

Table 4 – Requirements for accelerated ageing

Class	Test duration days	Test temperature °C	Minimum residual value from origin	Deviation from original values max
			Tensile strength	Elongation at break
1,	14	90 ± 2	75 %	± 50 %
2, 3	28			

7-3 Resistance to n-pentane

When tested in accordance with clause A-3, samples of the lining of hoses or tubing shall have absorption of n-pentane (α) not exceeding 10 % and an extraction of material by n-pentane (β) not exceeding 8 %.

8- Performance requirements of tubing and hoses

8-1 Visible defects evaluation

When evaluated according to clause A-4 no defect such as cracks, air bubbles or foreign particles shall be observed by normal corrected vision prior to testing on test pieces.

8-2 Cleanliness

When tested in accordance with clause A-5, the bore of the tubing or hose shall be clean and free from loose particles which might be transported by the gas.

8-3 Pressure requirements

When tested in accordance with EN ISO 1402, using as the fluid medium air or water for the working and proof pressure and water for the minimum burst pressure, the tubing or hose shall conform to the values given in Table 5.

Table 5 – Pressure requirements

Class	Maximum working pressure	Proof-pressure	Minimum burst pressure		Change in length at working pressure	Change in outside diameter at working pressure
			(23 ± 2) °C	(70 ± 2) °C		
	bar	bar	bar	bar	max. %	max. %
1	0,2	0,4	3,5	3,5	N.A.	N.A.
2	10	20	30	25	± 5	± 8
3	30	60	90	75	± 5	± 8

In preparation of the burst pressure test at 70 °C, the sample shall be conditioned in a water bath at 70 °C for minimum 4 h and maximum 6 h before pressure is applied.

8-4 Adhesion in hoses

When tested in accordance with EN ISO 8033 using type 2 test pieces, the minimum adhesion between the lining and the reinforcement and between the reinforcement and cover shall not be less than 1,5 kN/m in each case.

8-5 Resistance to kinking

When tested in accordance with clause A-6, the gas pressure shown on the manometer shall not drop by more than 15 mbar.

8-6 Resistance to crushing

When tested in accordance with clause A-7, after removal of the force, the tubing or hose shall show no deformation and it shall not leak when subjected to the proof pressure given in Table 5.

8-7 Low temperature flexibility

When tested in accordance with clause A-8 and then left at ambient temperature for at least 1 h, the tubing or hose shall show no signs of cracking or rupture and shall not leak when subjected to an internal air pressure equal to the working pressure given in Table 5.

When tested in accordance with EN ISO 1402, the tubing or hose shall meet the minimum values of proof and burst pressure given in Table 5.

8-8 Flame propagation

When tested in accordance with clause A-9, the tubing or hose shall not burn to either of the outer marks.

8-9 Permeability to propane

When tested in accordance with EN ISO 4080, at (35 ± 2) °C, using propane (at least 98 % propane) as the medium, and after a saturation period of at least 72 h at test pressure and test temperature and:

a) Method 1, at a pressure of 10 bar, for classes 2 and 3 hoses with a pricked cover, or

b) Method 2, at a pressure of 10 bar, for classes 2 and 3 hoses with an un-pricked cover, or.

c) Method 1, at a pressure of 0,2 bar at a temperature of (23 ± 2) °C, for class 1 tubing.

the volume of propane collected shall not exceed 5 cm^3/(mh) for class 1 and 30 cm^3/(mh) for classes 2 and 3.

8-10 Resistance to ozone

When tested in accordance with clause A-10, after exposure there shall be no cracks visible on the external surface when the hose or tubing is viewed under × 2 magnification.

8-11 UV (xenon arc lamp) test

Tubing and hoses are tested in accordance with EN ISO 30013, type 4 according to Table 1, method A, cycle 1, for 1 000 h. The specimens are to be fixed to ensure that the marking is facing the light source. There shall be no visible flaking or cracking of the cover or tubing when viewed under × 2 magnification.

Any change in colour shall be assessed by reference to the grey scale as described in ISO 105-A02, together with the assessment of any accompanying changes in hue or brightness.

The markings shall remain readable.

8-12 Loss in mass on heating (for non vulcanized (plastics) materials only)

When tested in accordance with EN ISO 176, method B, the plastics material used in the construction shall have a loss in mass not greater than 4 %.

8-13 Durability of the marking

After the test described in clause A-11, the part of the marking subjected to the friction shall be readable.

9- Marking

Each length of tubing or hose shall be clearly and durably marked in a contrasting colour at intervals of not more than 0,5 m with the information printed in characters at least 3 mm in height, and shall include at least the following information:

a) manufacturer's registered trade name/mark, e.g. XXX;

b) reference to Jordanian Standard, i.e. JS 502, or to another technically equivalent standard;

c) class of the product, e.g. class 3;

d) inside diameter in millimetres, e.g. 6,3 mm;

e) maximum working pressure in bar, e.g. 30 bar;

f) the words 'Propane/Butane';

g) for class 1 the expiry date as follows: "EXP DATE": followed by the year corresponding to 5 years after the manufacturing date;

Note: For tubings (class 1) manufactured from the 1st of September of year YYYY, the marking of the expiry date (EXP DATE) may be the year YYYY+6.

h) for classes 2 and 3, the manufacturing date as follows "PROD DATE": followed by the year of manufacturing;

Note 1: Requirements relating to expiry date for classes 2 and 3 are given in EN 16436-2.

Note 2: For hoses (classes 2 and 3) manufactured from the 1st of September of year YYYY, the marking of the manufacturing date (PROD DATE) may be the year YYYY+1.

i) marking giving a means to ensure the traceability of the batch. This marking is not necessarily printed.

Eample 1 (for class 1 tube):

XXX - EN 16436-1%deleted text&- class 1–10 mm – 0,2 bar-Propane/Butane - EXP DATE: Y-YYY.

The words 'Propane/Butane' should be used irrespective of the language.

Eample 2 (for class 2 hose):

XXX - EN 16436-1 - class 2–8 mm – 10 bar-Propane/Butane - PROD DATE: YYYY

Example 3 (for class 3 hose):

XXX - EN 16436-1 - class 3–6,3 mm – 30 bar-Propane/Butane - PROD DATE: YYYY

Note: Guidance on methods of marking are given in ISO/TR 17784.

j) country of origin.

Annex A
(Normative)
Test methods for tubing and hoses

A-1 Measurement of dimensions

Cut three pieces, each of 10 cm length, from both the ends and the middle of a 5 m long sample of tubing or hose. Measure the inside diameter and concentricity at both ends of all test pieces in accordance with EN ISO 4671.

A-2 Tensile strength and elongation at break

Carry out tensile strength and elongation at break measurements on six dumb-bell pieces of type 2, cut from 2 mm thick sheets of lining and cover materials, in accordance with ISO 37, at a test temperature of (23 ± 2) °C.
Sheet materials shall be from the same compound formulation as that used in the tubing or hose. These sheet materials shall be produced under conditions that are comparable to those used in the production of the tubing or hose.

A-3 Resistance to n-pentane

Weigh three pieces taken from the tubing or the lining of the hose. Each pieces shall be a minimum mass of 2 g (m_0 = mass of each pieces).
Immerse the test pieces in n-pentane (liquid) at a temperature of (23 ± 2) °C for $(72\ ^{0}_{-2})$ h. The volume of pentane used shall be at least equal to 50 times that of the test pieces.
Remove the test pieces from the n-pentane, wait for 5 min in air at ambient temperature and weigh (m_1).
Place the test pieces at a temperature of (40 ± 2) °C for $(168\ ^{0}_{-2})$ h then at a temperature of (23 ± 2) °C for $(24\ ^{0}_{-2})$ h then repeat the weighing (m_2):

$$\alpha = \%\ \text{pentane absorbed} = \frac{(m_1 - m_0)x100}{m_0} \quad \text{.....(A-1)}$$

$$\beta = \%\ \text{extracted matter} = \frac{(m_0 - m_2)x100}{m_0} \quad \text{..... (A-2)}$$

where
m_0: is the mass of each test pieces prior to immersion in n-pentane, in g;
m_1: is the mass of each test pieces following 72 h immersion and 5 min conditioning, in g;
m_2: is the mass of each test pieces following immersion and temperature conditionings, in g.

α and β are calculated for each piece. The retained values are the arithmetic mean of the three values of α and β.

A-4 Visible defects evaluation

The tests pieces to be used in clause 8-1 shall be sectioned longitudinally and judged for visible defects.

A-5 Cleanliness

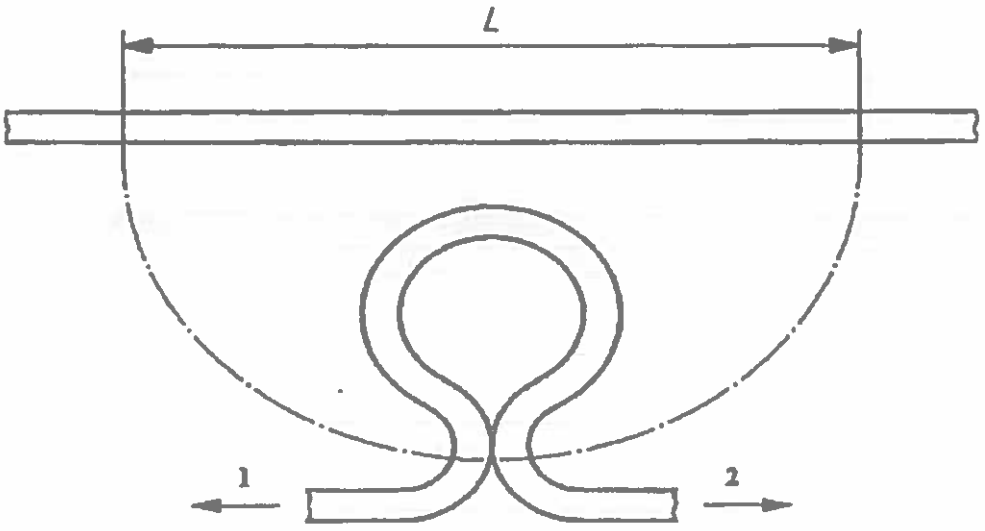
Connect one end of a straight length of 5 m of tubing or hose to a supply of air and the other to a tissue filter. Blow a stream of clean and filtered air at a velocity of 1 m/s for at least 1 min through the tubing or hose and check visually, by examination of the filter, for loose particles blown out from the tubing or hose.

A-6 Resistance to kinking

Connect one end of a straight length of tubing or hose to a pressure regulator and air supply at a flow rate of 0,20 m^3/h at 25 mbar and the other end to a water manometer, calibrated in mbar, in such a way that approximately 0,5 m of the test piece lies horizontally on a bench. Adjust the pressure to read 25 mbar with the air flowing through the orifice. Place a ruler, marked in millimetres on the bench alongside the tubing or hose under test.

Pick up, with the fingers, two points along the length of the tubing or hose spaced according to the dimensions given in Table A-1. Bring the points together so that the test piece takes the form of a loop, as shown in Figure A-1.

Record the pressure reading on the water manometer and calculate the pressure drop.



Key
1: to the pressure regulator and air supply
2: to the water manometer

Figure A – 1 – Test for resistance to kinking

Table A – 1 – Loop circumference

Dimensions in millimetres

Nominal inside diameter of tubing or hose	≤ 8	9	10; 10,5	12,5
Spacing L	280	310	350	440

A-7 Resistance to crushing

During the whole test period, the tubing or hose is maintained a test temperature of (70 ± 2) °C in air or water.
It is firstly conditioned without flow during a period of 4 h to 6 h.
It is then supplied with air maintained at (23 ± 2) °C and a constant pressure of (30 ± 2) mbar at the inlet of the test piece, during a period of 10 min to 15 min. A variable control previously fitted at the outlet end is adjusted to obtain a flow rate of (0,30 ± 0,03) m^3/h.
Finally a force of 75 N for tubing of class 1 or 125 N for hose of class 2 or 250 N for hose of class 3 is applied evenly over a length of 25 mm of the tubing or hose and after 30 s; while the force is still maintained on the tubing or hose, ensure the flow rate is not less than 0,10 m^3/h, the inlet pressure being adjusted to (30 ± 2) mbar.
After the resistance to crushing test, submit the tubing or hose to the proof pressure hold test in accordance with EN ISO 1402 with the proof pressure given in Table 5.

A-8 Low temperature flexibility

Test a length of tubing or hose in accordance with EN ISO 10619-2, method B at the minimum working temperature given in Table 1 under a diameter of curvature of 10 times the nominal bore (minimum of 80 mm).

A-9 Flame propagation

Support a length of not less than 150 mm of tubing or hose horizontally. Make three marks on the tubing or hose, the middle one approximately midway along the tubing or hose's length with one on either side, 50 mm from the middle mark.
Apply the flame of a Bunsen burner, of approximately 25 mm diameter, giving approximately 1 800 kJ/h, vertically below the middle mark on the test piece, so that the top of the blue part of the flame is approximately 10 mm from the lower surface of the test piece, see Figure A-2, for 5 s and then remove the flame for 1 s.
Repeat this cycle seven more times, i.e. the total test period is 48 s.
After the test period, observe whether the test piece continues to burn to the outer marks within 50 s of the commencement of the test.
A break in the test piece, before completion of the test period constitutes a failure of the test.
Propagation of burning past the marking constitutes a failure of the test.

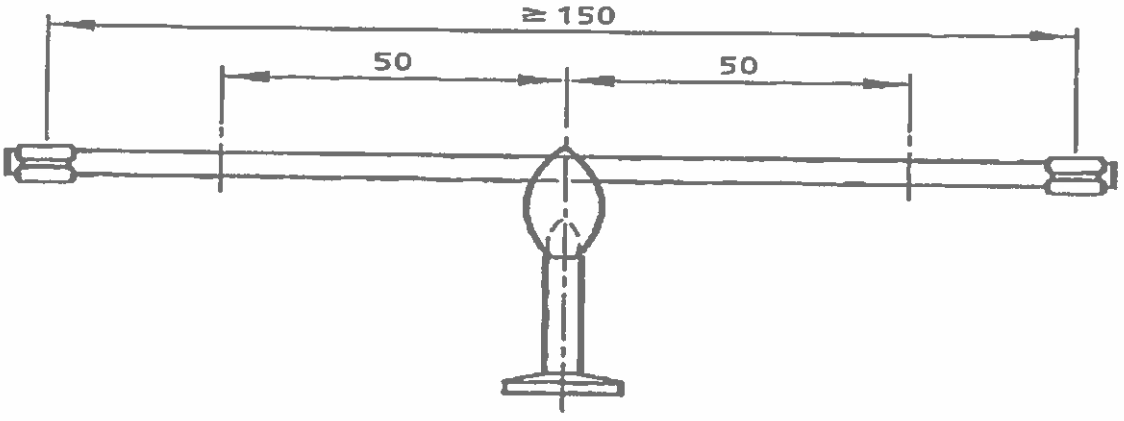


Figure A – 2 – Test for flammability

A-10 Resistance to ozone

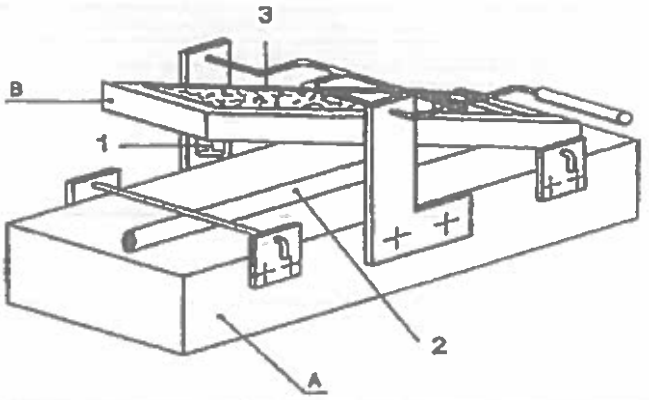
Place the assembly in an ozone cabinet as described in EN ISO 7326, method 1, with an ozone concentration of (50 ± 5) parts per hundred million (pphm) by volume for $\left(120\ ^{0}_{-2}\right)$ h at (40 ± 2) °C.

A-11 Durability of the marking

The test is carried out first with a demineralized water soaked cloth, then with a dry cloth and then with marketed peanut oil (CAS 8002-03-7) soaked cloth.
The testing device, an example of which is shown in Figure A-3, is constituted by:
- a base (A) which support the tube or hose;
- a ballasted mobile part (B) fitted with a full peg of circular section of 16 mm diameter without sharp edges to apply a rubbing force on the surface of the test piece.

Part B is moved back and forth on a linear path.
The tube or hose is fixed on the base (A).
The cotton cloth is chosen in accordance with ISO 105-A02.
The cloth is soaked with a mass of liquid equal to its own mass.
In order to check the impregnation of the cloth:
- the cloth is first weighed;
- the cloth is then immersed in the liquid until all the liquid has been absorbed.

Note: Weights are made with an accuracy of 0,1 g.
The cloth is attached to the peg.
The peg is pressed down on the test piece with a force of (9 ± 1) N. Ten backwards and forward strokes of 100 mm length are carried out within 10 s.



Key
A: base of the testing device
B: mobile part of the testing device
1: peg Ø 16 mm
2: test piece
3: ballast

Figure A – 3 – Test equipment for the verification of the durability of the marking

Annex B
(Informative)
Bibliography

[1] EN 449:2002+A1:2007, Specification for dedicated liquefied petroleum gas appliances — Domestic flueless space heaters (including diffusive catalytic combustion heaters).

[2] EN 461:1999, Specification for dedicated liquefied petroleum gas appliances — Flueless non-domestic space heaters not exceeding 10 kW.

[3] EN 1327:1996, Gas welding equipment — Thermoplastic hoses for welding and allied processes.

[4] EN ISO 3821:2010, Gas welding equipment — Rubber hoses for welding, cutting and allied processes (ISO 3821:2008).

[5] EN 561:2002, Gas welding equipment — Quick-action coupling with shut-off valves for welding, cutting and allied processes.

[6] EN 12164, Copper and copper alloys — Rod for free machining purposes.

[7] EN 16129:2013, Pressure regulators, automatic change-over devices, having a maximum regulated pressure of 4 bar, with a maximum capacity of 150 kg/h, associated safety devices and adaptors for butane, propane, and their mixtures.

[8] EN ISO 228-1, Pipe threads where pressure-tight joints are not made on the threads, Part 1: Dimensions, tolerances and designation (ISO 228-1:2000).

[9] EN 10226-1, Pipe threads where pressure tight joints are made on the threads, Part 1: Taper external threads and parallel internal threads — Dimensions, tolerances and designation

[10] ISO 197-1:1983, Copper and copper alloys — Terms and definitions, Part 1: Materials.

[11] ISO 197-3:1983, Copper and copper alloys — Terms and definitions, Part 3: Wrought products.

[12] ISO 1817:2011, Rubber, vulcanized or thermoplastic — Determination of the effect of liquids.

[13] ISO 8331, Rubber and plastics hoses and hose assemblies — Guidelines for selection, storage, use and maintenance.

[14] ISO/TR 17784, Rubber and plastics hoses and hose assemblies — Guide for use by purchasers, assemblers, installers and operating personnel.

Annex NA
(Normative)
National technical modifications

Table NA – 1 in this annex illustrates the technical national deviations from European standard 16436-1:2014+A3:2020 **"Rubber and plastics hoses, tubing and assemblies for use with propane and butane and their mixtures in the vapour phase, Part 1: Hoses and tubings".**
Single vertical bars (|) in the margins are used to indicate these technical national modifications of the European standard which have been changed.
Technical deviations are cross-referenced to the clause of the European standard together with reasons for these deviations.

Table NA – 1– List of national technical modifications

No.	Clause	Modification	Explanation
1	9	Add country of origin Clause j)	Applying the Jordanian Technical Regulation 119:2022 "Labeling – Labeling of industrial products"