



**BSI Standards Publication**

## **Fallopian rings — Requirements and test methods**

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## National foreword

This British Standard is the UK implementation of [ISO 19351:2019](#).

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A list of organizations represented on this committee can be obtained on request to its secretary.

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## Fallopian rings — Requirements and test methods

*Anneaux de fallope — Exigences et méthodes d'essai*



Reference number  
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## 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.

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](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on 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 the following URL: [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 157, *Non-systemic contraceptives and STI barrier prophylactics*.

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](http://www.iso.org/members.html).

## **Introduction**

Fallopian rings are devices which provide permanent contraception. These devices are elastic bands made from medical grade silicone. They are implanted bilaterally using a laparoscopic surgical procedure. After the rings are applied to each fallopian tube, they cut off the blood supply and occlude the tubal lumen. This stops the ova from travelling to the uterus, thereby preventing fertilisation. Fallopian rings are provided sterile and packaged as a set of two.

This document has been necessitated as a result of the product marketing experience gained by manufacturers and procurement agencies.

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# Fallopian rings — Requirements and test methods

## 1 Scope

This document specifies the minimum requirements and test methods for fallopian rings used for tubal occlusion in women for permanent contraception. This document does not address the applicator or other accessories used to place the fallopian rings.

## 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 10993-1](#), *Biological evaluation of medical devices — Part 1: Evaluation and testing within a risk management process*

[ISO 10993-3](#), *Biological evaluation of medical devices — Part 3: Tests for genotoxicity, carcinogenicity and reproductive toxicity*

[ISO 10993-5](#), *Biological evaluation of medical devices — Part 5: Tests for in vitro cytotoxicity*

[ISO 10993-6](#), *Biological evaluation of medical devices — Part 6: Tests for local effects after implantation*

[ISO 10993-10](#), *Biological evaluation of medical devices — Part 10: Tests for irritation and skin sensitization*

[ISO 10993-11](#), *Biological evaluation of medical devices — Part 11: Tests for systemic toxicity*

[ISO 11135](#), *Sterilization of health-care products — Ethylene oxide — Requirements for the development, validation and routine control of a sterilization process for medical devices*

[ISO 11137-1](#), *Sterilization of health care products — Radiation — Part 1: Requirements for development, validation and routine control of a sterilization process for medical devices*

[ISO 11137-2](#), *Sterilization of health care products — Radiation — Part 2: Establishing the sterilization dose*

[ISO 15223-1](#), *Medical devices — Symbols to be used with medical device labels, labelling and information to be supplied — Part 1: General requirements*

[ISO 15223-2](#), *Medical devices — Symbols to be used with medical device labels, labelling, and information to be supplied — Part 2: Symbol development, selection and validation*

ASTM F640, *Standard test methods for determining radiopacity for medical use*

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>



## 4 Requirements

### 4.1 Quality verification

Fallopian rings are mass produced articles manufactured in very large quantities. Inevitably, there will be some variation between individual rings, and a small proportion of rings in each production run might not meet the requirements of this document. Further, the majority of the test methods described in this document are destructive. For these reasons, the only practicable method of assessing conformity with this document is by testing a representative sample from a lot or series of lots. Basic sampling plans are given in [ISO 2859-1](#). Reference should be made to ISO/TR 8550 (all parts) for guidance on the use of acceptance sampling system, scheme or plan for the inspection of discrete items in lots. When on-going verification is required of the quality of fallopian rings, it is suggested that, instead of concentrating solely on evaluation of the final product, attention is also directed at the manufacturer's quality system. It should be noted that [ISO 13485](#) covers the provision of an integrated quality system for the manufacture of medical devices. Sampling plans shall be selected to provide an acceptable level of consumer protection. Suitable sampling plans are given in [Annexes A](#) and [B](#).

- a) [Annex A](#) describes sampling plans based on [ISO 2859-1](#) and is most applicable to manufacturers or purchasers assessing the conformity of a continuing series of lots. The full level of consumer protection available depends upon the switch to tightened inspection if deterioration in quality is detected. The switching rules, described in [ISO 2859-1:1999](#), Clause 9, cannot offer their full protection for the first two lots tested but become progressively more effective as the number of lots in a series increases. Use the sampling plans in [Annex A](#) when five or more lots are being tested.
- b) [Annex B](#) describes sampling plans, based on [ISO 2859-1](#), that are recommended for the assessment of isolated lots. The sampling plans in [Annex B](#) provide approximately the same level of consumer protection as those given in [Annex A](#) when used with the switching rules. It is recommended that these sampling plans are used for the assessment of fewer than five lots, for example in cases of dispute, for referee purposes, for type testing, for qualification purposes or for short runs of continuing lots.

It is necessary to know the lot size in order to derive the number of fallopian rings to be tested from [ISO 2859-1](#). The lot size will vary between manufacturers and is regarded as part of the process and quality controls used by the manufacturer. If the lot size is not known or cannot be confirmed by the manufacturer, then a lot size of 10,000 fallopian rings shall be assumed for determining the sample sizes for testing.

### 4.2 Physical requirements

#### 4.2.1 Dimensions

Fallopian rings are tested for the inner diameter and outer diameter in accordance with [Annex C](#) and shall conform to the requirements given in [Figure 1](#).

Cut rings shall be free from fibrous protrusions at the outer and inner surface. Angle of cut shall be at 90° ( $\leq 5^\circ$  angulations is allowed).



Dimensions in millimetres

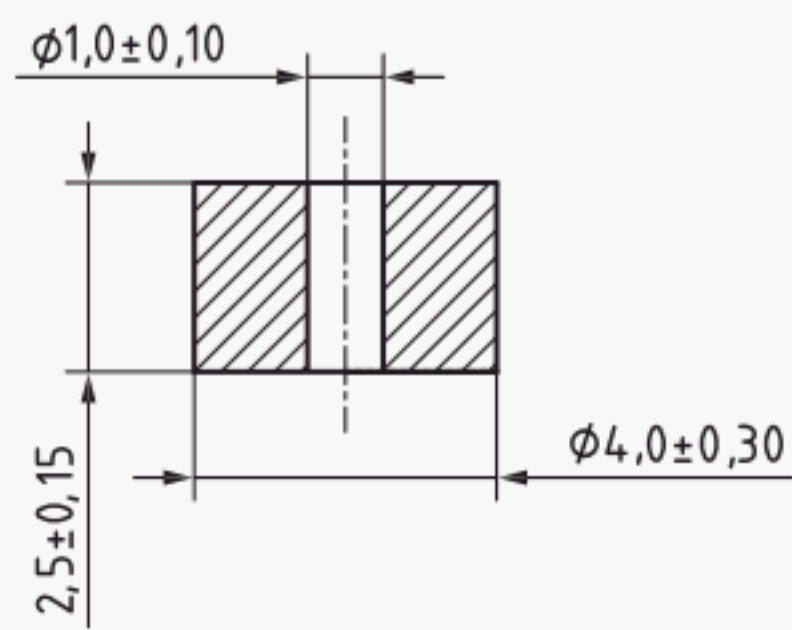


Figure 1 — Fallopian ring

4.2.2 Tensile properties

Fallopian rings tested in accordance with [Annex D](#) for the tensile properties shall conform to the requirements stated below.

- a) The force at break shall be  $\geq 20,50$  N.
- b) Elongation at force at break shall be  $\geq 560$  %.

4.2.3 Loading force on ring applicator

Fallopian rings tested in accordance with [Annex E](#) for the force of loading on ring applicator shall conform to the requirement stated below.

The force required to load fallopian rings on the ring applicator shall be  $\leq 35$  N.

4.2.4 Elastic memory

Fallopian rings tested in accordance with [Annex F](#) for the elastic memory shall conform to the requirement stated below.

The recovery of the inner diameter shall be such that the increase in the inner diameter  $\leq 25$  % of the original diameter.

4.2.5 Repeat loading strength

Fallopian rings tested in accordance with [Annex G](#) for the repeat loading strength shall neither break nor develop any cracks when viewed using  $\times 20$  magnification.

4.2.6 Visible defects

Fallopian rings tested for the visible defects shall not have defects such as discolouration, any fibres or protrusions on the ring.

4.3 Packaging

4.3.1 Packing mode

One pair of fallopian rings shall be packaged in peel open pouch/blister pack with seal width  $\geq 2$  mm.



#### 4.3.2 Primary pouch

Each pouch/blister pack shall ensure:

- a) adequate protection of the contents during normal handling, transit and storage for a period of 4 years;
- b) maintenance of sterility of the contents under dry, clean and adequately ventilated storage conditions at a temperature(s) ranging from 0 °C to 50 °C; and
- c) minimal risk for contamination of the contents during removal from the pouch/blister pack.

#### 4.3.3 Instruction for use

Every dispenser box shall be provided with at least one instruction for use describing the method to be adopted for:

- a) loading of rings on the ring applicator; and
- b) storage and handling requirements in clean and dry place.

#### 4.3.4 Package seal strength

Fallopian rings packs shall be tested for package seal integrity and seal strength in accordance with [Annex J](#) and peel force shall be 4,4 N to 19,0 N.

#### 4.3.5 Package seal integrity

Fallopian rings packs shall be tested for package seal integrity and seal strength in accordance with [Annex J](#) and there shall be no evidence of leakage of the package.

#### 4.3.6 Sterility

Fallopian rings supplied as sterile shall meet the requirements of sterility test as specified in the latest version of national/international pharmacopoeia.

The manufacturer shall establish procedures and systems to validate the type of sterilization used for the fallopian rings as sterility testing alone cannot be deemed as the criteria for confirming the sterility of the product. Validation of ethylene oxide sterilization process shall be done according to [ISO 11135](#) and gamma sterilization shall be done according to [ISO 11137-1](#) and [ISO 11137-2](#).

### 4.4 Biological requirements

The biological safety of fallopian rings shall be evaluated in accordance with the principles given in [ISO 10993-1](#), according to which fallopian rings are classified as a permanent contact implant device, and the following tests shall be complied with:

- a) cytotoxicity as per [ISO 10993-5](#);
- b) sensitization as per [ISO 10993-10](#);
- c) irritation or intracutaneous reactivity as per [ISO 10993-10](#);
- d) subchronic (Subacute) toxicity as per [ISO 10993-11](#);
- e) genotoxicity as per [ISO 10993-3](#);
- f) acute systemic toxicity as per [ISO 10993-11](#);
- g) implantation as per [ISO 10993-6](#).



These tests shall be repeated only in the case of a significant change such as change in formulation or grade of silicone tubing material, change in sterilization method, change in manufacturing process, etc.

The results of the test shall be reviewed and interpreted by a qualified toxicologist.

## **4.5 Radio-opacity**

Fallopian rings shall be radiopaque. This test shall be a type test used for the initial evaluation of the silicone elastomeric tubing material. ASTM F640 shall be referred for determining radio-opacity of the elastomeric material.

## **4.6 Clinical evaluation**

### **4.6.1 General**

Fallopian rings made of silicone-based elastomer have been used to effect female sterilization for nearly 50 years. They have been studied extensively, and clinical reports from the published literature<sup>[8]</sup> show a long history of safety and effectiveness. Rings manufactured in accordance with the requirements of this document are expected to have comparable clinical performance. This means the manufacturers' fallopian rings are similar to the fallopian rings used in the cited published clinical studies and comply with this document with respect to the following characteristics:

- peak load;
- elongation at peak load;
- strain capacity;
- loading force on ring applicator;
- elastic memory;
- repeat loading strength.

To establish conformance with this document for a new design of fallopian rings, the manufacturer shall demonstrate, using a one-sided test, that the upper limit of the 95 % confidence interval for a one-year pregnancy rate is  $\leq 2,0$  %. To establish this, the manufacturer shall sponsor a clinical study of its new design and demonstrate clinical safety and effectiveness. Completion of the one-year phase of the study is sufficient to begin marketing. However, the women in the study should be followed for an additional four years to record any additional pregnancies and serious adverse events.

### **4.6.2 New clinical study of manufacturer's fallopian rings**

A manufacturer may make significant changes to the fallopian ring with respect to design, materials or manufacturing procedures. In this case, the manufacturer shall sponsor a clinical study of its fallopian ring and demonstrate clinical safety and effectiveness. To this end, the sponsor shall conduct a single-arm clinical study, enrolling sexually-active women of reproductive age, following these women for a total of five years. Biostatistical analysis of the study shall show, using a one-sided test, that the upper limit on the 95 % confidence interval for the one-year failure rate (pregnancy) is less than 2,0 %. Completion of the one-year phase of the study is sufficient to begin marketing. However, the women in the study should be followed for an additional four years (a total of five years) to record any additional pregnancies and serious adverse events. Any unusual findings shall be included in updated labelling.

## **5 Storage condition**

The fallopian rings shall be stored at a temperature ranging from 0 °C to 50 °C.



## 6 Labelling

**6.1** If symbols are used on packaging information and marketing materials, the symbols shall meet the requirements as given in [ISO 15223-1](#) and [ISO 15223-2](#).

**6.2** Printing and illustrations shall be clear, legible and indelible. If labels are used, they shall be free from gross particulate matter and fibres.

**6.3** Each individual container shall be marked with the following:

- a) full name and address of manufacturer;
- b) batch number;
- c) method, month and year of sterilization (for year use four digits);
- d) storage directives;
- e) use/implant before (specify month and year, or year and month as per the national regulation; use four digits for year).

**6.4** In addition to those stated in [6.3](#), each individual package shall carry the following text:

- a) warning-sterile unless package is opened or damaged;
- b) fallopian rings shall not be kept loaded on the applicator for more than 15 minutes;
- c) a reference to this document (i.e. [ISO 19351:2019](#)) and reference to the instructions for use;
- d) the pouch/blister pack, once opened, shall not be resealed;
- e) any other requirement(s) mandated by the regulatory authorities in the country of use.

## 7 Shelf life

### 7.1 General

The fallopian rings shall meet performance specification as per the requirements given in [Clause 4](#) for the complete duration of the declared shelf life.

In case of a significant change in formulation, grade or source of the silicone tubing raw material, change in construction of the primary packing material, sterilization method, or manufacturing process, the shelf life of the fallopian rings shall be established by the following processes.

### 7.2 Procedure for determining shelf life by real-time stability studies

After testing in accordance with [Annex H](#), the fallopian rings shall meet the requirements given in [Clause 4](#). If the real time data indicate a shorter shelf life than that claimed on the basis of accelerated stability studies, the manufacturer shall notify the relevant regulatory authorities and direct purchasers on the shelf life of the product. The manufacturer shall change the shelf life claim for the product based upon the real time study. In no case shall the shelf life exceed 4 years. Real-time stability studies shall be performed for the full period of the shelf-life claim.

### 7.3 Procedure for determining shelf life by accelerated stability studies

After testing in accordance with [Annex I](#), the fallopian rings shall meet the requirements given in [Clause 4](#).



Annex A  
(normative)

Sampling plan and acceptance criteria for a continuing series of lot

A.1 If a party wishes to establish, by inspection and testing of samples of the final product, whether a continuing series of lots are in compliance with the requirements of this document, the sampling plans and acceptance criteria given in [Table A.1](#) shall be applied.

A.2 Manufacturers may use the schemes in [Table A.1](#) or they may devise and implement validated alternative quality control methods that result in at least equivalent consumer protection.

Table A.1 — Sampling plans and acceptance criteria for a continuing series of lots

Attributes	Inspection level	Acceptance criteria
Dimensions	20 pairs from each lot	All samples shall meet the requirements for dimensions
Tensile properties	Level S3 as in <a href="#">ISO 2859-1</a>	AQL 0,65
Loading force on ring applicator	Level S3 as in <a href="#">ISO 2859-1</a>	AQL 0,65
Elastic memory	Level S3 as in <a href="#">ISO 2859-1</a>	AQL 0,65
Repeat loading strength	Level S2 as in <a href="#">ISO 2859-1</a>	AQL 0,65
Visible defects	20 pairs from each Lot	No discoloration, fibres, protrusions
Package seal integrity and seal strength	Level S3 as in <a href="#">ISO 2859-1</a>	AQL 0,65
Packaging and labelling	20 pairs from each Lot	No printing defects
Sterility	As per National/International pharmacopeia	Shall comply

A.3 Applications for these sampling plans include the following:

- a) on-going production testing and quality control by a manufacturer;
- b) on-going testing by a purchaser for contractual purposes; and
- c) on-going inspection by a regulatory or certification authority.

**Annex B**  
(informative)

**Sampling plans intended for assessing compliance of isolated lots**

**B.1** The sampling plans given in [Table B.1](#), normal inspection, when applied to isolated lots, provide approximately the same level of consumer protection as those given in [Annex A](#) when used in conjunction with the switching rules. Attention is drawn to the possibility of using double or multiple sampling plans, which may reduce the total number of fallopian rings that need to be tested to demonstrate compliance when quality is significantly better than the AQLs. Sample sizes may be increased independently of the lot size to achieve a more reliable estimate of lot quantity.

**Table B.1 — Sampling plans and acceptance criteria for isolated lots**

Attributes	Inspection level	Acceptance criteria
Dimensions	20 pairs from each lot	All samples shall meet the required dimensions
Tensile properties	Level S4 to letter code J as in <a href="#">ISO 2859-1</a>	AQL 0,65
Loading force on ring applicator	Level S4 to letter code J as in <a href="#">ISO 2859-1</a>	AQL 0,65
Elastic memory	Level S4 to letter code J as in <a href="#">ISO 2859-1</a>	AQL 0,65
Repeat loading strength	Level S4 to letter code J as in <a href="#">ISO 2859-1</a>	AQL 0,65
Visible defects	20 pairs from each Lot	No discoloration, fibres, protrusions
Package seal integrity and seal strength	Level S4 to letter code J as in <a href="#">ISO 2859-1</a>	AQL 0,65
Packaging and labelling	20 pairs from each Lot	No printing defects
Sterility	As per National/International pharmacopeia	Shall comply

**B.2** Applications for these sampling plans include the following:

- a) type testing as part of a certification procedure;
- b) in case where the total number of lots being assessed are insufficient to allow the switching rules to be effective;
- c) in case of dispute involving isolated lots, e.g. for referee testing.



## **Annex C** (normative)

### **Determination of dimensions**

#### **C.1 General**

This test is used to determine the dimensions of the fallopian rings.

#### **C.2 Apparatus**

**C.2.1** Profile projector (minimum  $\times 20$  magnification).

**C.2.2** Thickness gauge of least count 0,01 mm.

#### **C.3 Procedure**

Open the pouch and remove the rings carefully.

Place the ring on the profile projector, and measure the inner diameter and outer diameter.

Thickness of the ring is measured using no load thickness gauge.

The test sampling plan and acceptance criteria are given in [Annex A](#) and [Annex B](#).

Test shall be carried at  $(25 \pm 2) ^\circ\text{C}$ .

The test report shall be prepared as given in [Annex K](#).



**Annex D**  
(normative)

**Determination of tensile properties**

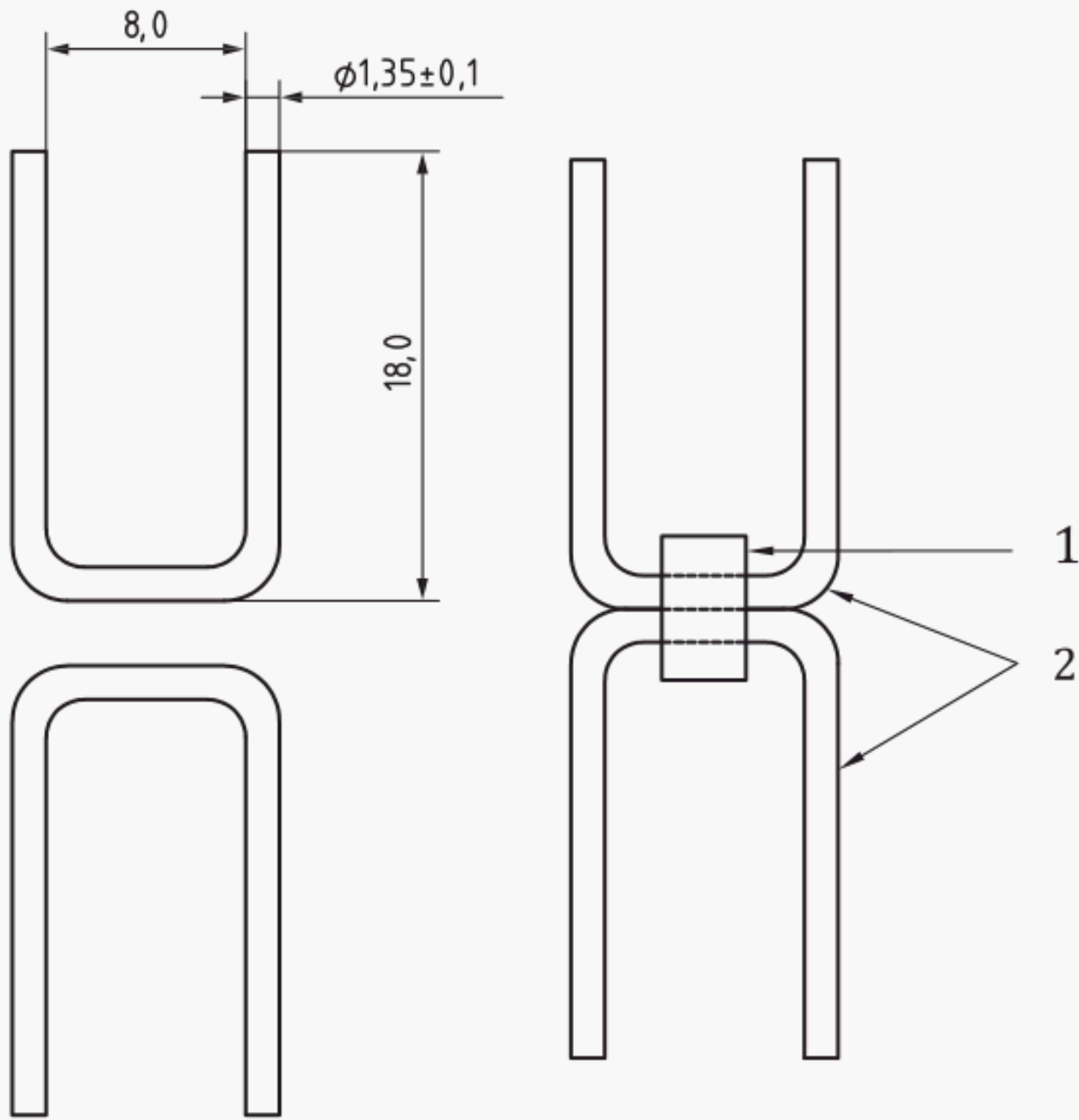
**D.1 General**

This test is used to determine the force at break (maximum load) and elongation at maximum load.

**D.2 Apparatus**

**D.2.1 U-shaped steel clips.**

Dimensions in millimetres



**Key**

- 1 fallopian ring
- 2 U-shaped steel clips

**Figure D.1 — Fallopian ring testing using U-shaped steel clips**

**D.2.2 Universal testing machine (UTM)**, table top type universal testing machine having the following specification shall be used to perform the tensile test:

- machine type: one-pillar traction;
- drive: motor;

- measuring range: 0 kN to 50 kN;
- test speed: 0 mm/min to 200 mm/min.

### **D.3 Procedure**

**D.3.1** The test is performed on a universal testing machine with special adaptors to hold two 'U' shaped steel clips (see [Figure D.1](#)). The crosshead separation speed is kept at 100 mm/min.

**D.3.2** Place the fallopian rings on two U-shaped steel clips and insert these clips into two adapter tubes, one attached to the fixed crosshead and other to the moving crosshead.

**D.3.3** The jaws are separated 100 mm/min and measure the load with the help of a load cell.

**Annex E**  
(normative)

**Determination of loading force on ring applicator**

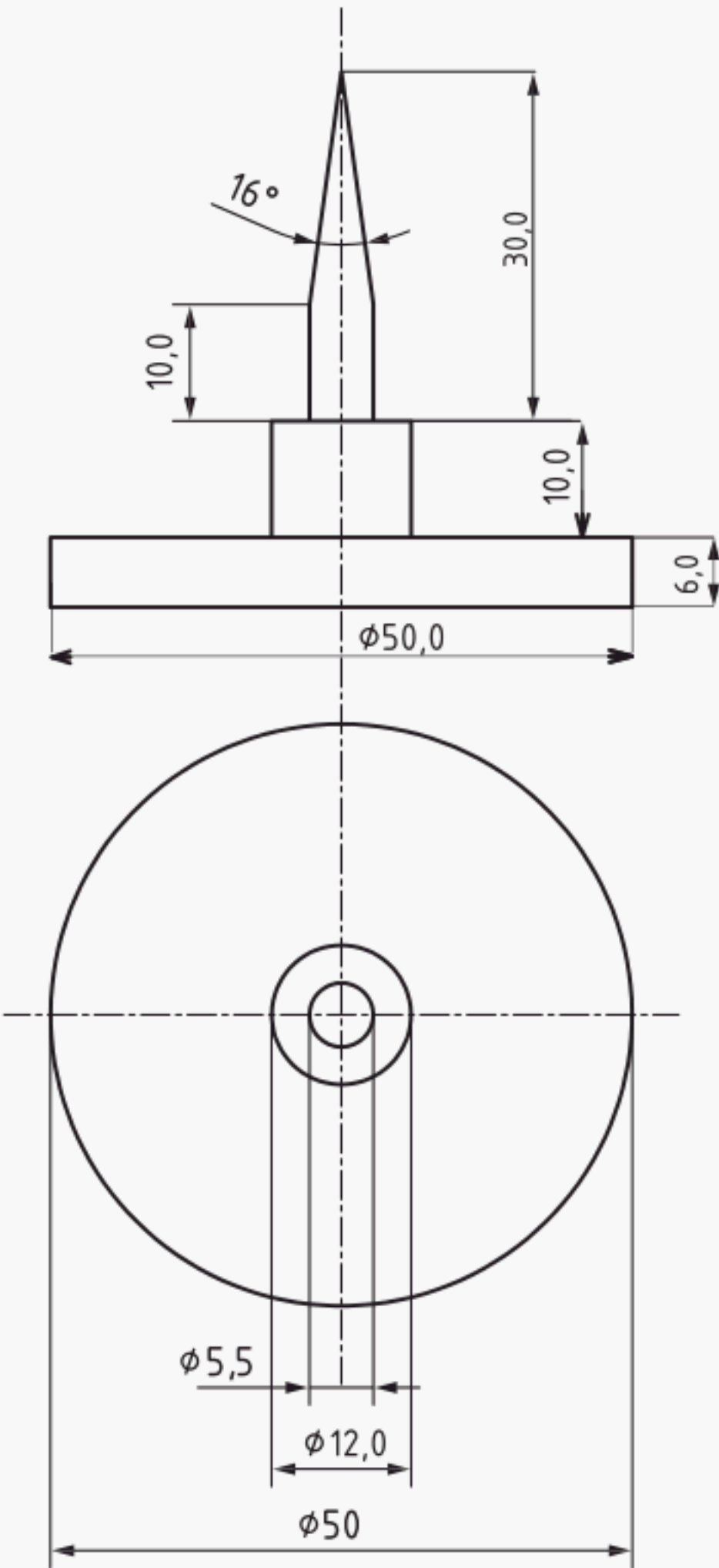
**E.1 General**

This test is used to determine the force required to load the fallopian rings on a ring applicator.

**E.2 Apparatus**

**E.2.1 Example of dilator cone.**

Dimensions in millimetres



**Figure E.1 — Dilator cone**



E.2.2 Eye bolt.

Dimensions in millimetres

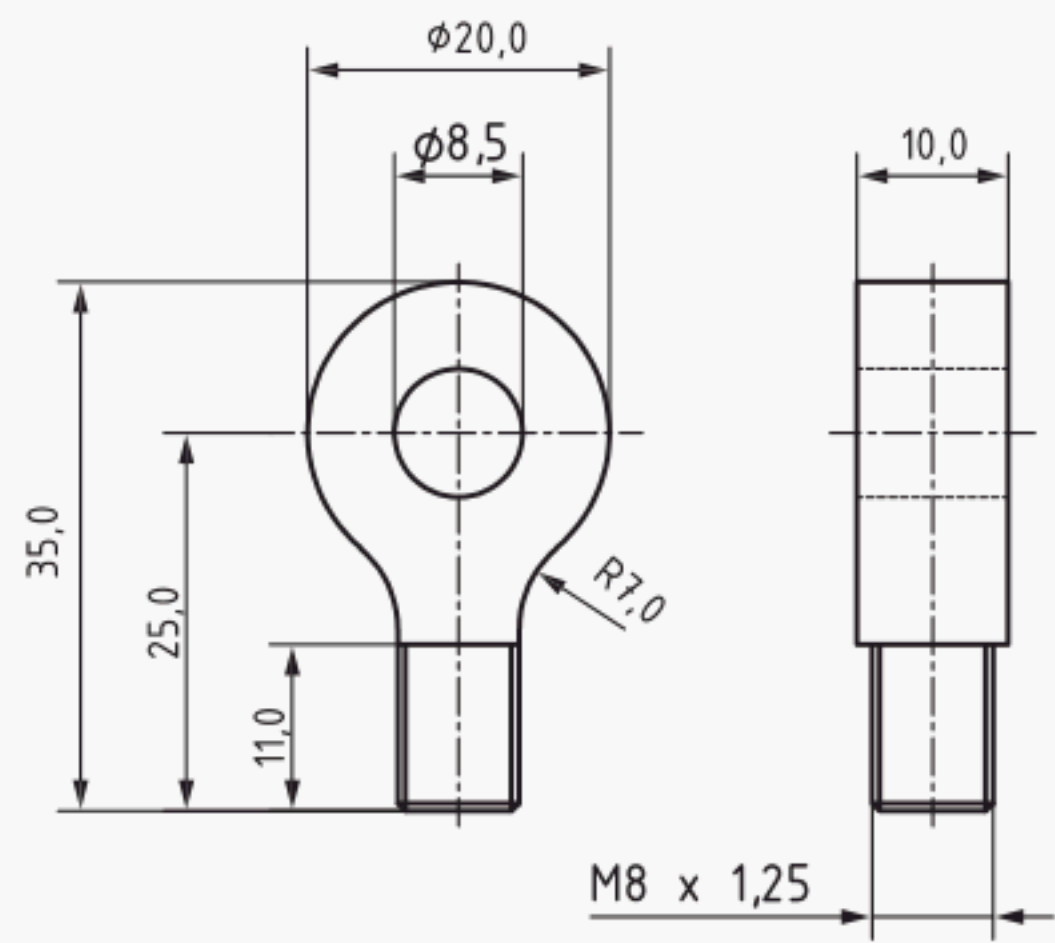


Figure E.2 — Eye bolt (for attaching to UTM)

E.2.3 Adaptor/fallopian rings pusher.

Dimensions in millimetres

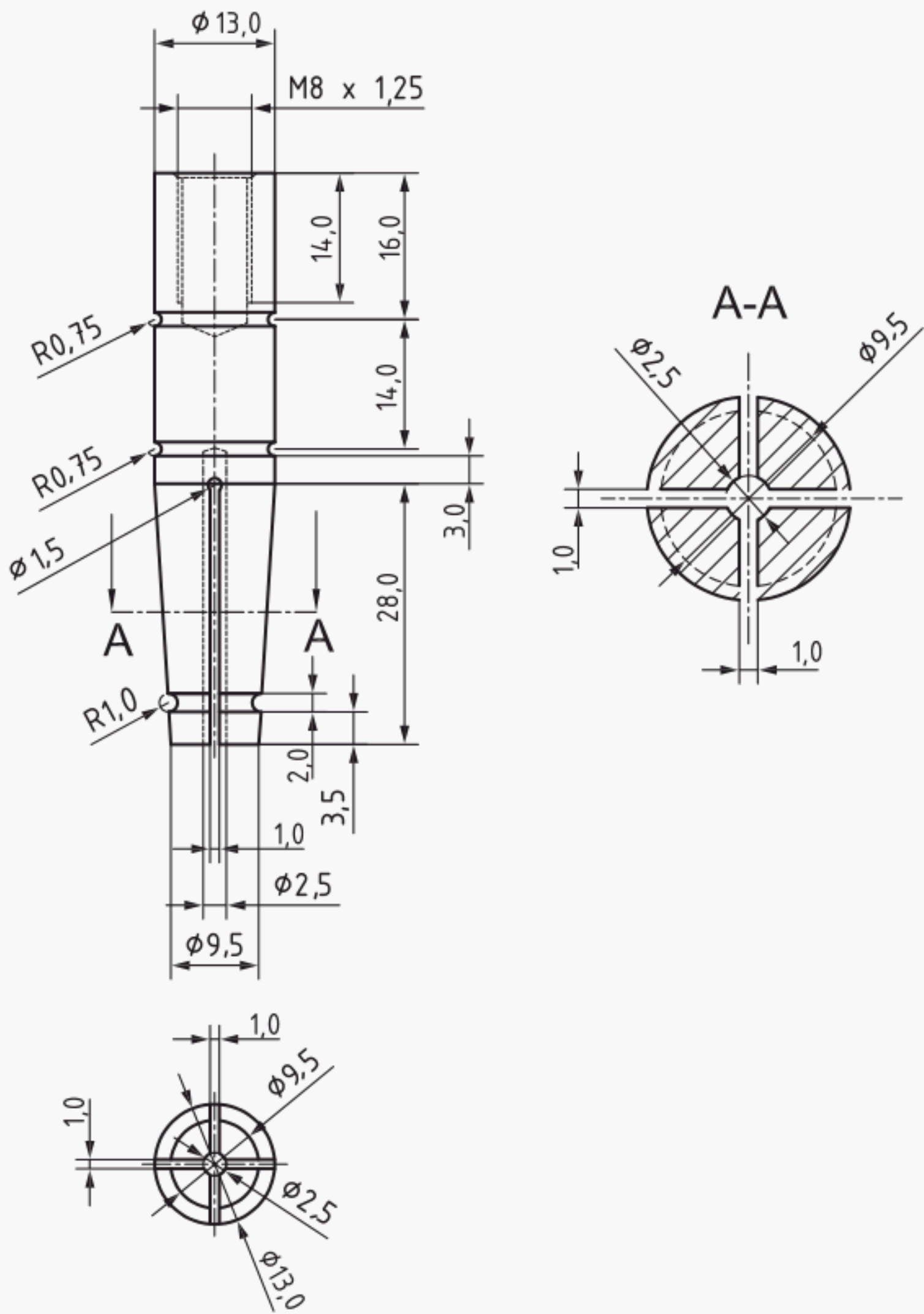


Figure E.3 — Adaptor/fallopian rings pusher



E.2.4 "O" ring.

Dimensions in millimetres

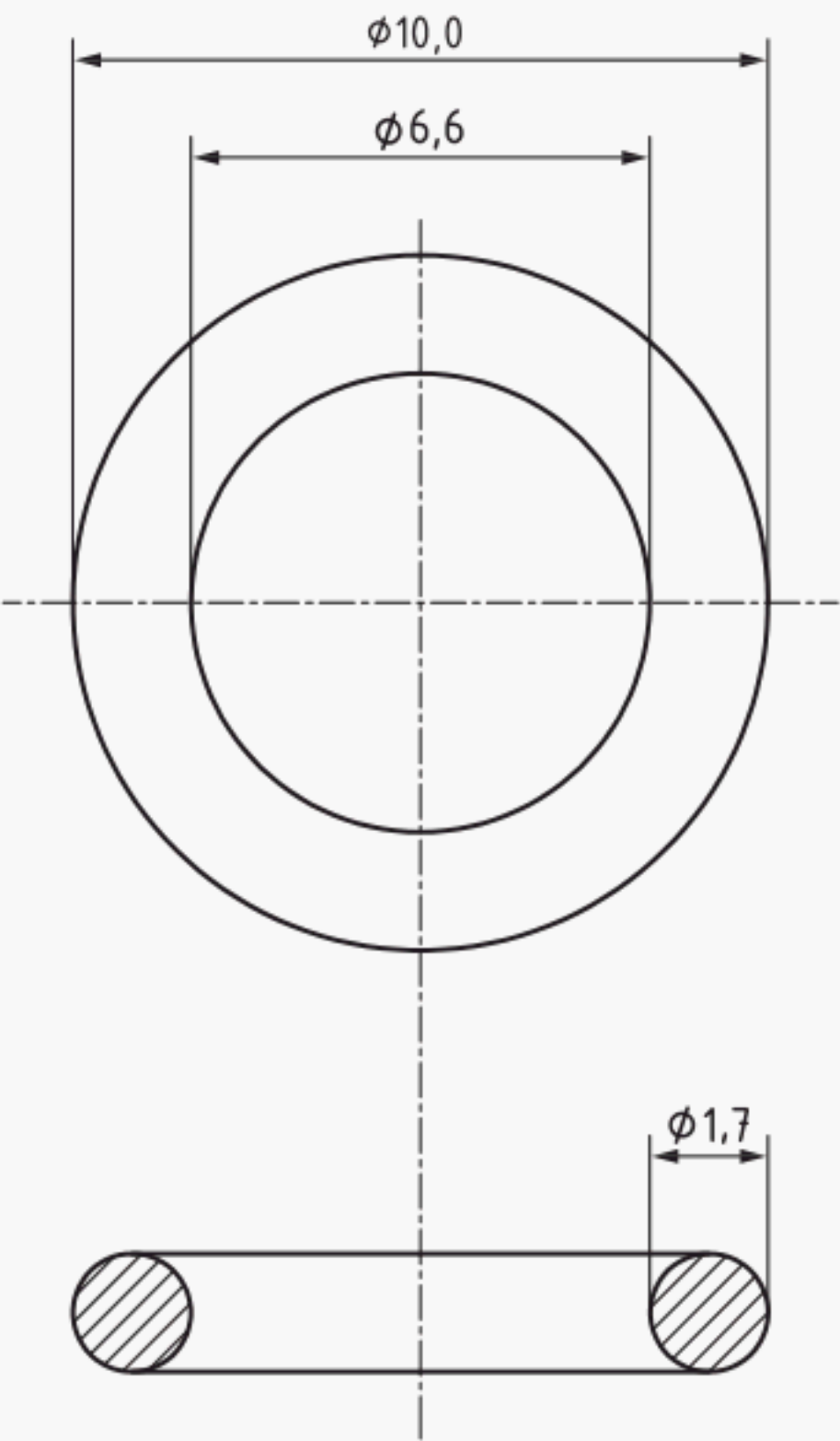
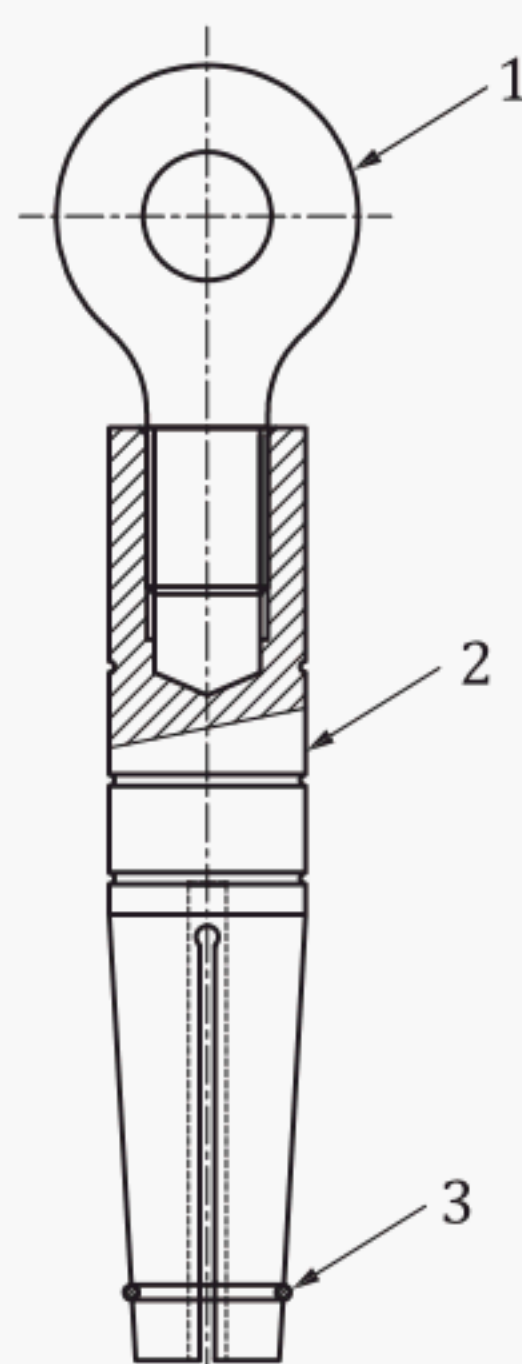


Figure E.4 — "O" ring

### E.2.5 Assembly drawing.



- 1 eye bolt
- 2 adaptor/fallopian rings pusher
- 3 "O" ring

**Figure E.5 — Assembly drawing**

## E.3 Universal testing machine (UTM)

Table top type universal testing machine having the following specification shall be used to perform the modulus test:

- machine type: two-pillar traction;
- drive: motor;
- measuring range: 0 kN to 50 kN; and
- test speed: 0 mm/min to 200 mm/min.

## E.4 Procedure

**E.4.1** This test shall be performed on a universal testing machine. A metal disc with a tube-like projection of 5,5 mm outer diameter in the centre which can hold the dilator cone (see [Figure E.1](#)) is placed on the compression plate whereas an adaptor (see [Figure E.3](#)) which can hold the guide is attached to the moving head using an eye bolt (see [Figure E.2](#)). The crossheads of the adaptor are banded together by using a rubber "O" ring (see [Figure E.4](#)). The crossheads are brought closer with a speed of 100 mm/min. To test the force, the fallopian rings are loaded on the dilator cone using water as lubricant and the guide is brought right at the top of the dilator cone. The jaw fixed with assembled adaptor (see [Figure E.5](#)) is moved closer and the load is measured with the help of a compression cell.



**E.4.2** The test sampling plan and acceptance criteria are given in [Annex A](#) and [Annex B](#).

**E.4.3** Test shall be carried at  $(25 \pm 2)$  °C.

**E.4.4** The test report shall be prepared as given in [Annex K](#).

## **Annex F** (normative)

### **Determination of elastic memory**

#### **F.1 General**

This test determines the capacity of the fallopian rings to recover its inner diameter after stretching to 5,5 mm for an extended period.

#### **F.2 Apparatus**

**F.2.1 Dilator cone** (see [Figure E.1](#)).

**F.2.2 Profile projector** (minimum  $\times 20$  magnification).

#### **F.3 Procedure**

Measure the initial inner diameter of the fallopian rings using a profile projector.

Load the fallopian rings on a dilator cone for a period of 30 min and then remove and allow recovering its inner diameter under unstretched condition for 1 min.

After recovering for 1 min, measure the inner diameter of the fallopian rings using a profile projector.

The percentage increase in inner diameter is calculated.

The test sampling plan and acceptance criteria are given in [Annex A](#) and [Annex B](#).

Test shall be carried out at  $(25 \pm 2) ^\circ\text{C}$ .

The test report shall be prepared as given in [Annex K](#).



## **Annex G** (normative)

### **Determination of repeat loading strength**

#### **G.1 General**

This test determines the ability of the fallopian rings to maintain its physical shape and dimensions even after repeated loading and unloading on the band applicator or equivalent fixture.

#### **G.2 Apparatus**

**G.2.1 Fixture**, see [Figure G.1](#).

**G.2.2 Profile projector** (minimum  $\times 20$  magnification).

**G.2.3 Programmable stopwatch**.

#### **G.3 Procedure**

The fallopian rings shall be loaded on a band applicator or equivalent fixture (see [Figure G.1](#)) and after keeping it loaded for 20 min, it is unloaded.

The process of loading and unloading is repeated on the same ring for four times after a gap of 1 min between each cycle.

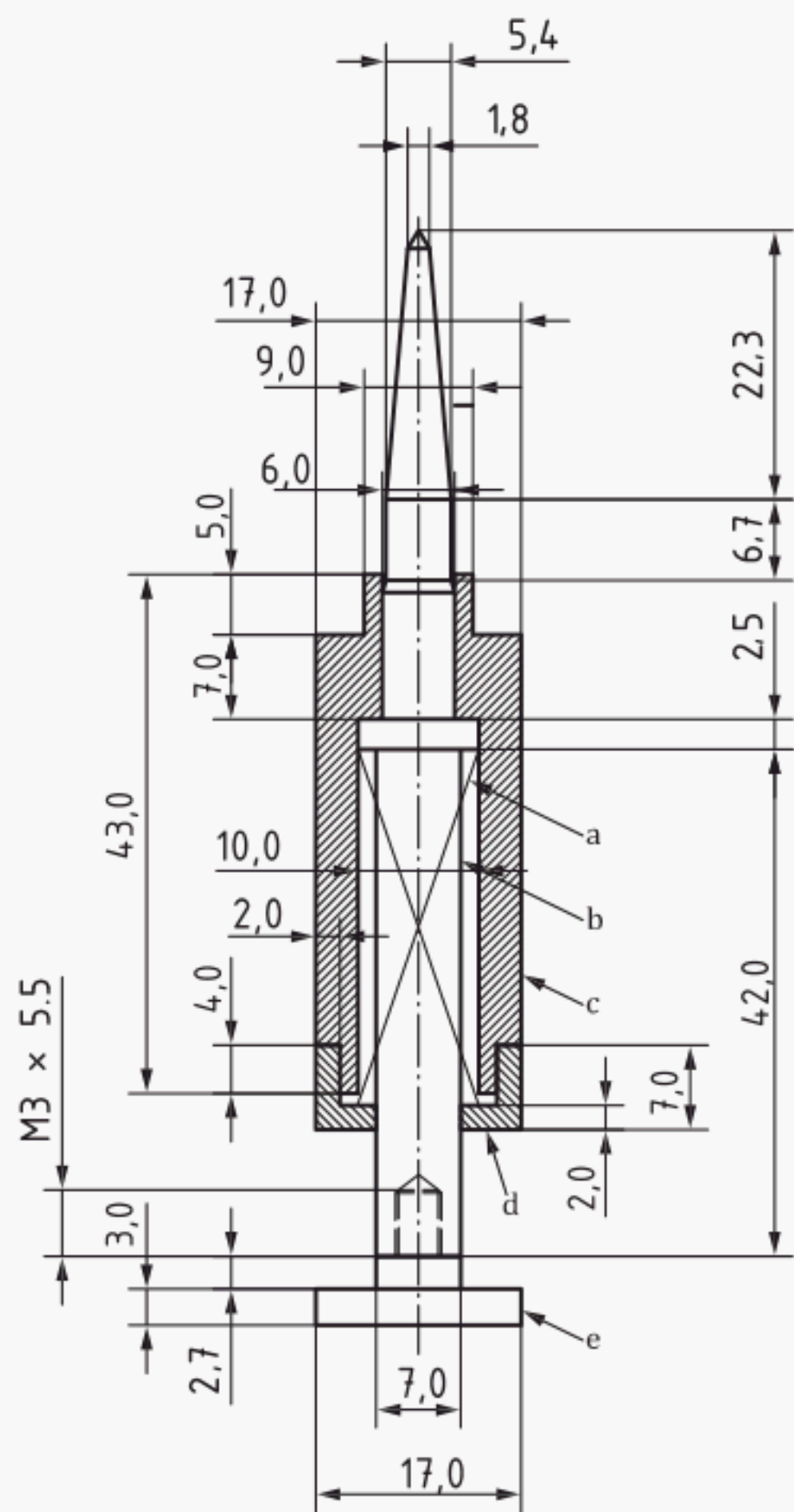
The ring is observed for cracks or breakage. The ring shall neither break nor develop any crack.

The test sampling plan and acceptance criteria are given in [Annex A](#) and [Annex B](#).

Test shall be carried at  $(25 \pm 2) ^\circ\text{C}$ .

The test report shall be prepared as given in [Annex K](#).

Dimensions in millimetres



- a Compression spring.
- b Plunger.
- c Housing.
- d Endcap.
- e Stopper.

Figure G.1 — Repeat loading strength test fixture



Annex H  
(normative)

Determination of shelf life by real time stability study

H.1 General

Real time stability study shall be conducted under a fixed set of storage conditions to determine use before date of the product.

H.2 Apparatus

**Method A:** Air-oven method using a cell-type oven or cabinet oven with low air speed and a ventilation of 3 to 10 changes per hour.

**Method B:** Air-oven method using a cabinet oven with forced air circulation by means of a fan and a ventilation of 3 to 10 changes per hour. The oven equipment and air changes shall be specified and can be of either type but shall be consistent throughout the study.

H.3 Procedure

The study shall be conducted from the representative samples from three consecutive lots manufactured. The rings shall be stored in its primary package under the conditions mentioned in [H.4](#). Sufficient number of samples shall be taken for evaluation of properties mentioned in [Table H.1](#).

Table H.1 — Sampling plans and acceptance criteria

Attributes	Inspection level	Acceptance criteria
Dimensions	20 pairs from each lot	All samples shall meet the required dimensions
Tensile properties	Level S4 to letter code J as in <a href="#">ISO 2859-1</a>	AQL 0,65
Modulus	Level S4 to letter code J as in <a href="#">ISO 2859-1</a>	AQL 0,65
Elastic memory	Level S4 to letter code J as in <a href="#">ISO 2859-1</a>	AQL 0,65
Repeat loading strength	Level S4 to letter code J as in <a href="#">ISO 2859-1</a>	AQL 0,65
Visible defects	20 pairs from each Lot	No discoloration, fibres, protrusions
Package seal integrity and seal strength	Level S4 to letter code J as in <a href="#">ISO 2859-1</a>	AQL 0,65
Packaging and labelling	20 packages from each Lot	No printing defects
Sterility	As per national/international pharmacopeia	Shall comply
Sterility test shall be performed at-least at the start and end of the real time stability test.		
It is recommended that additional samples shall be included in the study to allow for re-tests and mistakes.		

#### **H.4 Test method**

The relative humidity (RH) for the real time stability study shall be maintained at  $(65 \pm 5)$  % RH and temperature  $(30 \pm 2)$  °C.

The sample shall be evaluated for the attributes mentioned in [Table H.1](#) at a frequency not more than 12 months between two consecutive test periods.

#### **H.5 Test report**

The test report shall be prepared as given in [Annex K](#).



**Annex I**  
(normative)

**Determination of shelf life by accelerated stability study**

**I.1 General**

Accelerated stability study shall be conducted under varied set of storage conditions to determine the minimum shelf life until the real time stability studies are completed.

**I.2 Apparatus**

Humidity chamber and hot air oven would be used to maintain the storage conditions for the accelerated stability studies.

**I.3 Procedure**

The study shall be conducted from the representative samples from three consecutive lots manufactured. The fallopian rings shall be stored in its primary package under conditions mentioned in [I.4](#). Sufficient number of samples shall be taken for evaluation of properties mentioned in [Table H.1](#).

**I.4 Test method**

The test samples will be maintained at three sets of storage conditions and tested at intervals as below:

<b>Set 1</b>	The test samples will be maintained at a relative humidity of 75 % and temperature of 50 °C. The samples will be tested at intervals of 30, 60, 90, 120, 150 and 180 days.
<b>Set 2</b>	The test samples will be maintained at a temperature of 60 °C maintained with dry heat. The samples will be tested at intervals of 7, 14, 30, 60 and 90 days.
<b>Set 3</b>	The test samples will be maintained at a temperature of 70 °C maintained with dry heat. The samples will be tested at intervals of 7, 14, 30, 60 and 90 days.

The critical parameters to measure are as below:

- a) tensile properties;
- b) elastic memory;
- c) package seal integrity and seal strength.

The sampling plan is as per [Table H.1](#).

NOTE Minimum stability requirements are finalized based on the results of the protocol on accelerated stability study. This study is in progress.

## Annex J (normative)

### Package seal integrity and seal strength

#### J.1 General

This test is used to determine the seal strength of the packs and the package seal integrity of the packed fallopian rings. This test is based on [ISO 11607-1](#) and [ISO 11607-2](#).

#### J.2 Apparatus

**J.2.1 Package seal integrity tester**, capable of generating an absolute pressure of  $(20 \pm 5)$  kPa.

**J.2.2 Universal testing machine (UTM)**, table top type universal testing machine having the following specification shall be used to perform the tensile test:

- machine type: two-pillar traction;
- drive: motor;
- measuring range: 0 kN to 50 kN; and
- test speed: 0 mm/min to 200 mm/min.

#### J.3 Procedure

##### J.3.1 Package seal strength

The test is performed on a universal testing machine attached with jaws to carry out the peel strength of the sealed layer.

The test method measures the force required to separate the standard seal in 25 mm width specimen from the flexible packaging material.

The test specimen cut down from the pouches are clean and cut perpendicular to the direction of the seal.

The free ends of the specimen are fixed in a suitable grip for holding in a universal testing machine adjusted with a cross head speed of 100 mm/min.

Continuously increasing tensile force is applied with sample supported at an angle of  $90^\circ$  by hand and the maximum force required to separate the seal is recorded.

The test report shall be prepared as given in [Annex K](#).

##### J.3.2 Package seal integrity

Individual containers are subjected to vacuum at  $(20 \pm 5)$  kPa absolute pressure.

Hold the vacuum for  $(60 \pm 5)$  sec.

Any containers not expanding, when subjected on completion of the holding period is deemed to have failed in the package seal integrity test.



The test report shall be prepared as given in [Annex K](#).

## **Annex K** **(normative)**

### **Reporting of test results**

**K.1** The test report shall contain at least the following information:

- a) name and address of the test laboratory;
- b) name and address of the client;
- c) identification of the test report;
- d) identification of the sample (device name, sample size, lot number and lot size);
- e) origin of the sample, date of the sample's arrival to the laboratory and identity of the responsible party who has taken the sample;
- f) a reference to this document, i.e. ISO 19351:2019, and the relevant annexes;
- g) description of all deviations from this document;
- h) results according to relevant annexes including mean, standard deviation, maximum value, minimum value, etc.;
- i) measurement error, if available; and
- j) date of test report and signature and title of the person(s) responsible for the report.









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## BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

